International Association of Oil & Gas Producers

REPORT 590 | MAY 2017

Aircraft Management Guidelines

Version 2

Acknowledgements

Aviation Subcommittee

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REPORT
590

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2017

Aircraft Management Guidelines

Version 2

Revision history

VERSION	DATE	AMENDMENTS
2	May 2017	New module added: Module S6
1 (as 590)	February 2017	Modularized and revised throughout. Withdrawal of 390-A14 (now covered by Module S4).
5 (as 390)	August 2013	Addition Appendix 13, Appendix 14 published as report number 390-A14, updates to sections 4.2.5, 8.1.8, 12.4 and 12.5.3
4	August 2011	Replacement of section 3, addition of section 4.6, withdrawal of Appendix 2
3	November 2010	Updates to sections 4.3, 4.3, 4.5, 5.3, 5.6, 6.7, 8.1, 9.9, 11.9 & Appendices 1, 3, 4, 5A, 5B & 11.
2	July 2008	Sections 4.3, 4.4, 8.1, 8.2 & Appendix 5
1	April 2007	New issue (minus Appendix 8)

Scope

Report 590, *Aircraft Management Guidelines* (AMG) provides recommended common guidance for the safe, effective and efficient management of all aviation operations. It is based on best practices developed in collaboration with the oil and gas offshore transport/aviation industry. Following the AMG will minimize risk in the management of aviation.

This report provides a ready reference for the management of aviation. It covers operations from the conceptual phase onwards. In so doing, it addresses the factors to be taken into account when contemplating aircraft operations, the tendering and contractual process, the setting up of support facilities and the expectations required of our contractors.

The AMG should be adopted by all Member companies. It is important to remember that the AMG is a set of guidelines – the ultimate responsibility for safety lies with the Members and their contracted operators.

The AMG and the readily available support from Aviation Advisors should assist those responsible for managing aviation, particularly if they are not aviation specialists, to plan, develop and control, safely and efficiently, air transport operations that are best suited to their needs.

IOGP guidelines

IOGP has developed the set of guidelines contained in this manual based on a number of core guidelines and recognized industry best practices. The guidelines are largely based on existing international legislation (ICAO) and safety codes. Where appropriate, they are further developed as described in this manual.

The AMG provides supplemental guidance to requirements legislated by National Aviation Authorities (NAA) and guidance provided by aircraft operators. Nothing in these guidelines should be adopted if it does not meet the national regulations or ICAO requirements. The most stringent provisions should always be adopted.

Where these guidelines cannot be achieved fully for practical reasons, an Aviation Advisor should seek mitigating measures using a formal risk assessment process.

For certain operations, these guidelines might need to be augmented with specified additional advice (e.g. Standard Operating Procedures and specific equipment) to reflect the local circumstances and operating conditions.

The AMG is available for use by aircraft operators in order to meet the expectations of IOGP Members. If operators have difficulty in meeting the recommendations in the AMG, they should contact the contracting Member's Aviation Advisor for guidance or to find an alternative means of following this guidance. The contracting Member's Air Operations Supervisor (AOS) or aviation focal point should be able to assist in communications with the Aviation Advisor.

Structure of the AMG

This issue of the AMG comprises the following modules.

Each module contains a statement of whom it applies to and what it covers, guidance and (where needed) reference material.

590-A ***Key elements of aviation management*** (V1 Feb 17)

590-B ***Safety Management System, Quality and Emergency Response*** (V1 Feb 17)

590-C ***Personnel qualifications, experience and training*** (V1 Feb 17)

590-D ***Aircraft operations*** (V1 Feb 17)

590-E ***Continuing airworthiness and maintenance*** (V1 Feb 17)

590-F ***Airfields, heliports, helidecks and facilities*** (V1 Feb 17)

590-G ***Recommended aircraft and personal equipment*** (V1 Feb 17)

Specialized operations:

590-S1 ***Specialized operations: Airborne geophysical*** (V1 Feb 17)

590-S2 ***Specialized operations: Aerial pipeline inspections*** (V1 Feb 17)

590-S3 ***Specialized operations: Cold weather operations*** (V1 Feb 17)

590-S4 ***Specialized operations: Interim guidance on night operations*** (V1 Feb 17)

590-S5 ***Specialized operations: Hoisting*** (V1 Feb 17)

590-S6 ***Specialized operations: Unmanned aerial systems*** (V1 May 17)

Seismic operation is covered in IOGP Report 420, *Helicopter guidelines for land seismic & helirig operations*.

Wordfinder

Each term is followed by the 590 module number (module A or module B, etc.) then a page number (not section number).

Wordfinder

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590-A
Key elements of aviation management

Purpose

The purpose of this module of the Aircraft Management Guidelines (AMG) is to provide all IOGP Members the basis on which they may establish effective procedures and guidelines for the selection, procurement and management of their aviation transport and support services.

It provides the foundation for the rest of the AMG.

Scope

This module covers:

- setting an Aviation Policy
- Contractual – Aviation Advisor support
- the role and responsibilities of an Air Operations Supervisor
- the principles of operator review
- use of contracted and non-contracted aircraft and insurance.

This module is applicable to all Members.

Contents: 590-A

1 Setting an Aviation Policy Contractual (Aviation Advisor role)

Members should consider the establishment of an aviation policy to provide for the safe and efficient use of aircraft in support of company operations. Such a policy should apply equally to the company and the contractors' personnel.

As an example, the aviation policy could require the following.

a) An Airline Usage Policy should be developed, which should require preference be given to the use of airlines which meet the Member's specified criteria. Where any doubt exists, advice should be sought from an Aviation Adviser. See IOGP Report 418, *Airline safety assessment mechanism* [1].

b) Exposure to high-risk operations should be minimized.

c) For all aviation activities other than scheduled airline travel, only aircraft operators and aircraft types approved for use by an Aviation Advisor should be used.

d) Contracted aircraft should only be operated by aircrew and maintained by engineers who meet specified minimum qualifications, experience and currency requirements. See AMG 590-C, *Personnel qualifications, experience and training* [2], sections 1 and 2.

e) Aircraft operators should meet company insurance requirements.

f) Operations should meet public transport standards and published aircraft performance criteria. Specific operational restrictions may be applied.

g) The decision to use aircraft should be weighed against the alternatives of using other forms of travel, taking full account of operational, economic and above all, safety implications.

h) Members and their contracted aircraft operators should comply with applicable national safety management system regulations.

Contract Management – Aviation Advisor Support

Member companies should appoint a suitable number of Aviation Advisors to provide technical expertise on aviation matters. In addition, to the roles discussed below, others include: regular reviews of contracted aircraft operators, one-time flight reviews, scheduled airline assessments and ongoing support to business units through Air Operations Supervisors.

In the early stages of planning a new venture where air transport is being considered, the involvement of an Aviation Advisor has proved invaluable in determining the optimal solution for aviation transport requirements. In such cases, Aviation Advisor representation on the scouting team provides the necessary expertise to evaluate influencing factors such as terrain, distances, climate, SAR facilities, and make timely recommendations including advice on design criteria for remote airfields or for helipads or helidecks. In remote and developing areas, a considerable lead time (typically a minimum of six months) may be required to ensure availability of suitable aircraft operated by an approved contractor.

For longer-term contracts and contract renewal, advice should also be sought from the Aviation Advisor on the detailed contract terms to ensure that applicable standards are included in the contract.

Where the air support requirements on a contract are particularly complex or extensive in their scope, consideration should be given to appointing a qualified aviation professional for on-site management of the specific operation.

2 The Role of the Air Operations Supervisor (AOS) focal point

Air Operations Supervisor will be used as the generic term in this publication, be they an **Aviation Coordinator**, **focal point**, or other localized or Member-specific term.

All Members using aircraft should nominate an Air Operations Supervisor (AOS) focal point, responsible for overseeing aviation activities in accordance with the advice laid down in this manual. Advice to the AOS should be available at all times from the nominated Aviation Advisor.

Those responsible for the supervision of air transport within a Member's business units typically range from qualified pilots or professional aircraft maintenance engineers to others with no previous knowledge of aviation. Other variations include EP ventures, where the Operations Manager, Logistics Manager, or a member of their staff looks after air transport support, often in conjunction with other responsibilities.

The scope of work varies enormously: from simply chartering aircraft to meet specific tasks, with passenger handling undertaken by the aircraft operator or an agent, to operating an owned fleet of aircraft with company owned facilities including airfields, helipads, helidecks, passenger scheduling and handling. The running of such facilities will require the setting up of in-house procedures, establishing competency training, provisioning equipment and putting in place a safety management system.

The training needs of an AOS should be tailored to the experience level and qualifications of the person selected, taking into consideration the scope of the work required to be undertaken, an outline of which is given in section 4, below.

3 Duties and responsibilities of the Air Operations Supervisor

The person appointed as the Air Operations Supervisor (AOS) may be tasked to:

a) ensure that the utilization of aircraft is in accordance with the policy set in place by the Member company; in particular, that only those operators approved by the Aviation Advisory staff are used and any conditions set out in the operator's contract or operations manual are followed

b) maintain contact with those dealing with flight bookings to ensure only staff authorized to travel are booked to travel

c) maintain records of all flights including details of:

   1) sectors flown

   2) numbers of passengers and/or weight of freight by sector

   3) flying hours

   4) aircraft availability (delays and the causes)

   5) incidents and accidents.

d) confirm the numbers of Senior Executives or key personnel carried on a single flight fall within the Member's guidelines

e) make periodic visits to the operator to verify operations are being performed in accordance with applicable regulations, operations/maintenance manuals, Member's aviation requirements and contract language

f) follow up outstanding audit recommendations to confirm action on compliance and advise the Aviation Advisory staff as necessary

g) ensure all aircraft accidents and incidents that occur involving aircraft operated for the Member are fully reported and copied to the Aviation Advisory staff. Investigate, as far as possible, the circumstances of aircraft accidents and incidents involving third parties and also copy these to the Aviation Advisory staff

h) take prevailing weather conditions in the area of operation into consideration when planning flights. Ensure the operator and Member's business unit have weighed adverse weather conditions and other factors against the importance of completing the flight, and the appropriate level of authorization has been obtained

i) closely monitor the utilization of pilots to ensure that only those currently approved and within crew/duty time limits are assigned to flights

j) track the status of navigation aids, weather instruments, fuel systems and other support equipment.

Where airfield/airstrip(s), heliport(s), or helideck(s) are provided, additional responsibilities may include:

a) air-ground communication

b) fire/rescue support

c) provision of fuel

d) airfield/airstrip/heliport management/preparation

e) passenger check in/out

f) raising manifests/weighing passengers and freight

g) control of security

h) organization of customs/immigration as required.

In these cases, the Aviation Advisor should be consulted to assist in developing the required support based on the specific task, locality and situation.

4 Principles of review

The purpose of a review is to determine the suitability of an aircraft operator in terms of safety and capability. The reviewer should make recommendations for improvements where appropriate.

The reviewer should also cover any interfaces between the contractor, third parties and the member. Examples include but are not limited to: airfields, passenger services, flight following, helidecks, refuelling equipment, scheduling, etc.

Reviews should be carried out in accordance with defined terms of reference. The standards applied will be those established by the Member company except where the National Aviation Regulations, which apply to the aircraft operator, are more restrictive or otherwise exceed the Member's standards.

Where the aircraft operator is contracted to more than one Member company, joint or concurrent reviews involving all affected Members may be conducted to minimize the time the operator is detracted from providing the service.

After completion of the review, a report should be accomplished and delivered to all parties within an agreed time period.

5 One-time acceptances

See 4.2 (Risk assessments) of AMG 590-B, *Safety Management System, Quality and Emergency Response* [3].

Operators used for ad hoc charter flights should be subject to an on-site review. If this is not practical, an exception, based solely on documentation provided by the operator, may be granted subject to any special criteria the Member's Aviation Advisor deems appropriate for the operation.

Each one-time flight request should be subject to a formal risk assessment.

It must be recognized that such a one-time acceptance provides less assurance about the safety of the operation and the contractor's suitability for the proposed task.

Aircraft operators receiving a 'one-time acceptance' should not subsequently be used until they are subjected to a full review.

6 Contracted air operators

Any aircraft operator invited to tender should be reviewed and accepted in accordance with the procedures of the Member company.

All accepted operators should be reviewed on a regular basis. The frequency of review should be based on: risk, exposure, usage and performance since the previous review. All ongoing/long-term operations (exceeding one year in length) should be subject to initial review.

Start-up operations, those with a high level of activity, or a high level of perceived risk should be considered for more frequent oversight.

Aircraft operators should not be used without a current acceptance.

7 Use of third party (Turnkey) contracts

Turnkey contracts should meet Member's requirements prior to use.

8 Use of scheduled airlines and airline safety

Members should endeavour to provide information that allows their business travellers to select and use those airlines representing the lowest risk for the route to be flown.

To this end, IOGP has developed Report 418, *Airline safety assessment mechanism* (ASAM) [1] which can be used by Members to compare the relative risks of travelling on scheduled airlines and decide whether the risks associated with airline travel are compatible with the business need. The ASAM takes into account a significant number of factors that contribute to the relative risk of an airline.

9 Use of non-scheduled aircraft

When travel by non-scheduled aircraft is deemed appropriate, this may be on dedicated contract aircraft, by spot charter or on aircraft of joint venture partners. In such cases, advice should be sought from the Aviation Advisor regarding the status, with respect to the Member's policies and requirements, of the aircraft operator and aircraft type and the qualifications of the pilots to be used.

See section 5 for one-time acceptances and subsequent review requirements.

10 Use of private or non-accepted aircraft

During the course of conducting company business, personnel are sometimes invited to travel in private aircraft or in aircraft operated by non-reviewed or non-accepted companies, often at very short notice. Providing time permits, the Aviation Advisor may be able to offer advice in respect of non-reviewed companies.

Members should consider using a one-time acceptance process (see section 5) as a guide to the operator's ability and to assist management in the risk assessment of such flights.

11 Use of public sector aircraft

In the course of conducting its activities, a Member may be offered the use of public sector aircraft, e.g. those operated by law enforcement or other government agencies. The aircraft offered may be military types or civil aircraft that might not otherwise conform with civil airworthiness requirements. It is also possible that these aircraft are operated outside of the civil aviation regulations.

There may be situations or locations where the use of a public sector aircraft by a Member is warranted, in which case advice from the Aviation Advisor should be sought to determine how to assess whether use of these aircraft can accepted or should be declined.

12 The use of unapproved aircraft for emergency and Med-rescue flights

See AMG 590-B, *Safety Management System, Quality and Emergency Response*, section 8 (Emergency Response Planning) and section 12 (Helicopters used for Medical Evacuations).

Whenever Members have ongoing operations within any given area, they should pre-plan, prequalify and proactively contract for aircraft services necessary to provide emergency evacuations, especially medical evacuations, where the time required to get patients to competent and comprehensive medical care can make the difference between life and death. Helicopters on long-term contract to provide medical evacuation services should at least comply with the requirements for transport helicopters used in the same environment.

Therefore, the following process should apply:

a) Controls should be in place to ensure that the IOGP Member management and medical advisors only call for Med-rescue flights when the level of illness/injury warrants the evacuation of the patient. These controls should form one part of the Emergency Response Plans for the operation or site.

b) Wherever possible, contracts should be in place with Med-rescue service companies such as those with known international reputations.

c) In circumstances when an unapproved operator must be used, taking into due account the relevant time constraints, IOGP member Aviation Advisors should be consulted making their best efforts to conduct an exceptional "one-time acceptance" based solely on documentation provided by the operator. Such an acceptance may be given subject to certain criteria that should be met and accepted by the IOGP member company.

d) It must be recognized that such a one-time acceptance provides less assurance about the safety of the operation and the contractor's suitability for the proposed task. Aircraft operators receiving a 'one-time acceptance' should not be used subsequently until they are subjected to a full review as explained above.

e) If no review can be conducted, the use of aircraft, as supplied, is accepted on the basis that the exposure and risk of using unaudited/unapproved aircraft is outweighed by the risk of further suffering or loss of life to the patient who is the focus of the medical emergency.

13 Aircraft insurance and indemnity

13.1 Level of insurance

The Member should determine the level of insurance required in line with its company risk management guidelines.

13.2 Evidence of insurance

Members should require that:

a) each aircraft operator provides documentary evidence of the required insurance coverage

b) such insurance not be cancelled or changed materially during the course of the contract without at least thirty day's written notice to the Member

c) subrogation, cross-liability and additional insured clauses are in place

   1) to the extent necessary to reflect indemnities given by an aircraft operator under the contract, insurers should waive rights of action/ subrogation against the Member and the Member should be named as an additional insured under the policy

   2) liability insurance should contain a severability clause (Cross Liabilities).

13.3 Additional cost

The Member's Risk Management and or insurance specialists/advisors should be consulted if there will be a cost associated with the requirement to name the Member as additional insured or to obtain a waiver of subrogation.

References

Only the latest version of a reference should be used.

1) IOGP. Report 418, *Airline safety assessment mechanism*.

2) IOGP. Report 590, *Aircraft Management Guidelines* (AMG).
Module 590-C, *Personnel qualifications, experience and training*.

3) IOGP. Report 590, *Aircraft Management Guidelines* (AMG).
Module 590-B, *Safety Management System, Quality and Emergency Response*.

Version 1

590-B
Safety Management System, Quality and Emergency Response

Purpose

The purpose of this module of the AMG is to define minimum requirements for contracted operators' Safety Management System (SMS), Quality Assurance (QA), and Emergency Response Planning (ERP).

Scope

This module of the AMG contains information on the legal requirement for an aircraft operator to have an SMS, the IOGP's advice in the absence of a legal requirement, guidance on the essential elements of an SMS, the hazard/risk management process, accident and incident reporting, Quality Assurance, environmental management, guidance on risk assessment and risk reduction and emergency response planning.

This module is applicable to aviation providers and IOGP Members.

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Contents: 590-B

1 Regulatory requirements

Safety Management Systems (SMS) are a regulatory requirement in most countries. The International Civil Aviation Organization (ICAO) is driving the shift in regulatory position:

"From 01 January 2009 each applicant for the grant of an Air Operator's Certificate (AOC) shall establish a safety management system appropriate to the size and complexity of the operation, for the proactive management of safety that integrates the management of operations and technical systems with financial and human resource management, and that reflects quality assurance principles".

National Aviation Authorities (NAA) may have different timescales for AOC holders to implement an SMS.

2 IOGP guidance

Members and their contracted aircraft operators are required to comply with applicable national SMS regulations insofar as they relate to air operations and associated infrastructure.

However, where national regulations have not yet been mandated for SMS, Members should require of owned or contracted aircraft operators, the SMS requirements detailed in Table 1.

In addition, IOGP members should require aircraft operators to communicate any changes in risk tolerance that might result from changes to operating or management processes, procedures, practices or other risk management strategies.

Table 1: SMS requirements for owned and contracted aircraft operators

Services	Exposure	SMS Requirement
Helicopter i. Personnel & Cargo transport onshore and offshore ii. External load carry including Heli-Assist Seismic & Helirig operations iii. Pipeline survey & other inspection & survey operations onshore & offshore iv. Geophysical survey v. Helicopter external transport service (HETS) Class D helicopter evacuation (Long line rescue) **Aeroplane** i. Personnel & cargo transport ii. Pipeline survey & other inspection & survey operations iii. Geophysical iv. Medical evacuation (medevac)	**Standard contract** Total flight exposure to an operator for single or combined business units for >100 hours per annum (pa) for all helicopter and aeroplane survey ops & >200 hours pa for aeroplane passenger ops	An SMS that contains auditable evidence of all 10 of the functional elements detailed in section 3 (or equivalent) Alternative Means of Compliance (if following a different model). In particular, operator must be able to demonstrate a hazard/risk management process in accordance with section 4 covering the contracted and related aviation activities, implemented effectively within a maximum of 6 months (at which point the minimum SMS elements will be audited for compliance). Additionally: **Airborne Geophysical Survey:** Complete and document a project specific IAGSA RA for review by the Member's Aviation Advisor prior to commencing operations. **Seismic, Helirig or HETS:** Complete and document a project specific hazard/risk management process in accordance with section 4 prior to commencing operations. **Pipeline Survey:** Complete and document a project specific hazard assessment that includes location, route & type/activity specific content for review by the Member's Aviation Advisor prior to commencing operations **Business Executive Charter Operations** A hazard assessment meeting IS-BAO requirements is acceptable
	Short term and ad hoc contracts Total flight exposure to an operator for single or combined business units: <100 hours pa for helicopter or aeroplane survey ops & < 200 hours pa for aeroplane passenger ops	An operator SMS, including a hazard/risk management process in accordance with section 4 is preferred when selecting an operator but, recognizing the short term use and low exposure, a commitment to develop an SMS with sustained progress, measured through the audit process is acceptable **Airborne Geophysical Survey, Pipeline Survey, Seismic, Helirig or HETS** Requirements as stated above
	One Time Charter	An operator Flight Safety Programme with a hazard/risk management process in accordance with section 4 should be in place. A robust flight safety programme should be assessed alongside the other requirements for a one-time charter.

3 Safety Management System Components and Elements

The range of SMS guidance documentation obtainable in references [1] to [10] describe an SMS in a number of different ways. This module describes the SMS in terms of four conceptual components and implemented by 10 actionable elements.

Internationally there are four interactive components identified as the key functional components of SMS:

1) Safety Policy
2) Safety Risk Management
3) Safety Assurance
4) Safety Promotion.

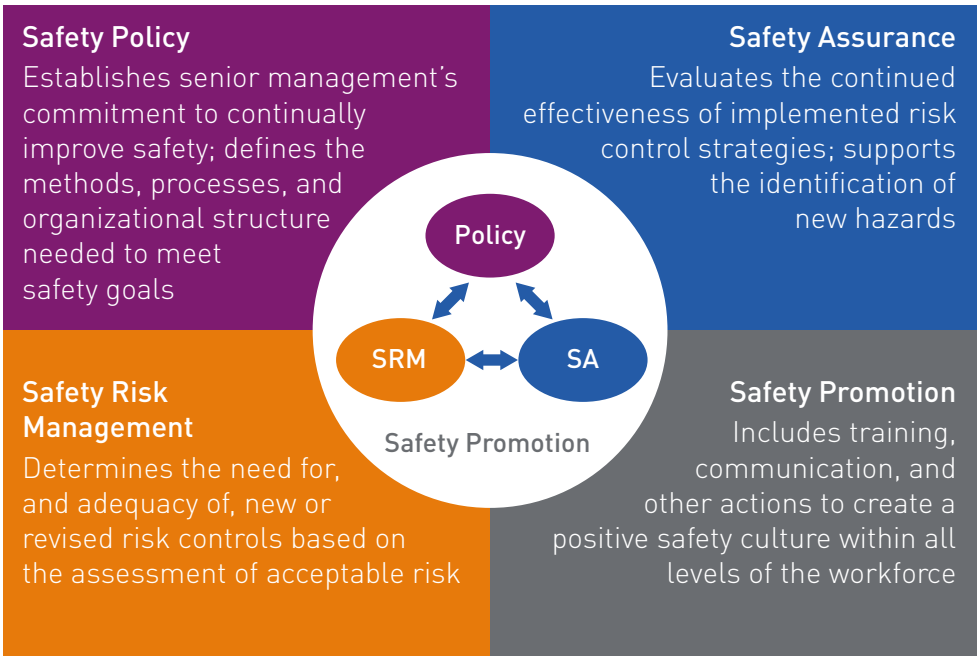

Figure 1: The Four SMS Components

Regulatory requirements and/or individual Members may describe the four components and supporting elements in different terms. In the absence of more stringent regulatory or Member requirements, and subject to the guidance defined in Table 1 (SMS requirements for owned and contracted aircraft operators), Members should require the Ten Elements in Table 2 (The Ten Elements of an SMS) to be effectively implemented within their own and contracted aircraft operators' SMS.

It is recognized that the size and complexity of the aircraft operator will be reflected in the structure and complexity of the elements of the SMS.

Table 2: The Ten Elements of an SMS

a	Leadership Commitment	Active SMS involvement and support from an informed company leadership
b	Policy, Accountabilities & Key Performance Indicators (KPI)	A defined HSE policy, based on a 'Just' culture, defined responsibilities for safety management and KPIs
c	Documented Procedures	Documented, detailed procedures covering all SMS activities and processes as well as more broadly documented procedures for safety critical tasks related to aircraft operations, including flight operations, aircraft maintenance and ground operations
d	Personnel and Competence	Appointment of key safety personnel, with defined competence requirements; sufficient resources to manage and operate an effective SMS; competencies defined, measured and reviewed for personnel in operational and other safety-critical roles; training programs implemented supporting above competencies
e	Safety Communications	A range and hierarchy of safety communication processes to enable an effective, two-way flow of safety information throughout the company
f	Safety Reporting and Investigation	Safety reporting procedures covering regulatory required reports, lower level incidents and occurrences, and other inputs, e.g. audits/reviews, FDM/FOQA, surveys; an investigation process to generate and follow internal recommendations to closure
g	Management of Change	A defined procedure to manage the risks associated with significant change related to aircraft operations, including key personnel
h	Hazard/Risk Management	See section 4 (Hazard/Risk Management Process) for more details
i	Quality Assurance (QA)	An internal process focused on providing confidence that the risk measures specified through regulation, company operating procedures and the risk management process are effective within all flight operation, maintenance and ground operation activities. See section 6 (Quality Assurance) for more details
j	Senior Management Review	A management review process, based on a defined meeting schedule, that gives senior managers visibility of the SMS activity, in particular safety reporting, hazard management and QA issues.

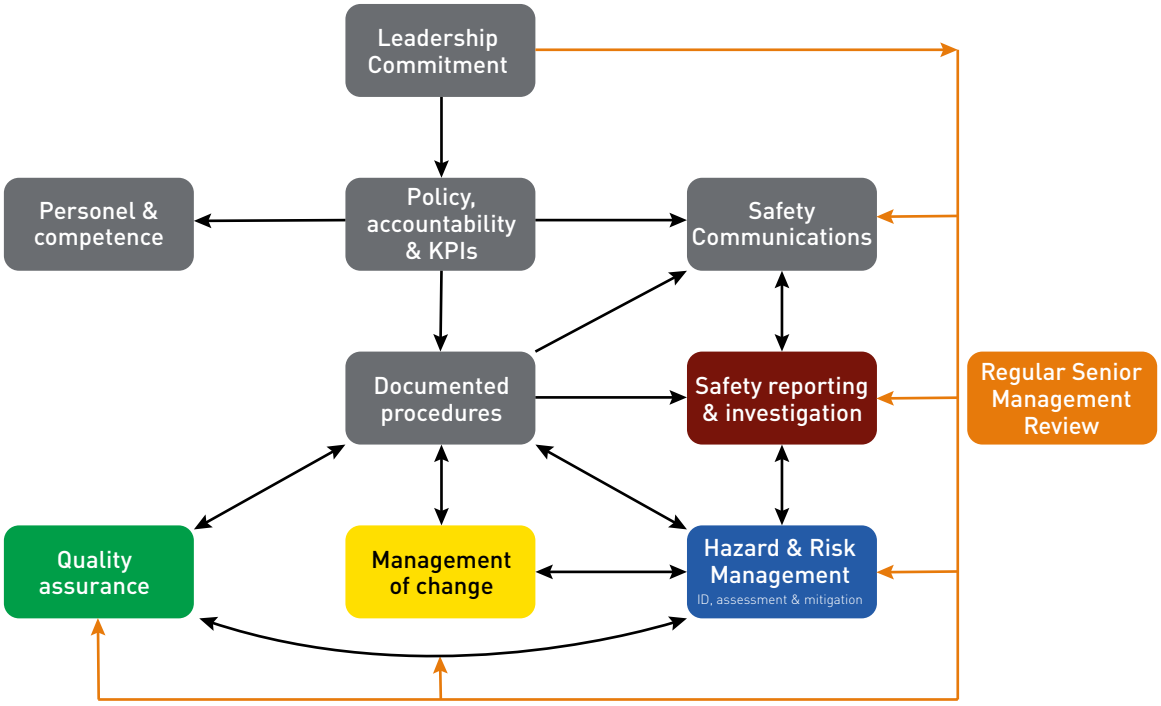

Figure 2: Required SMS elements and relationships

These elements should be coordinated through the SMS processes to ensure activities and actions complement one another and support the effectiveness of the SMS as a whole.

4 Hazard/Risk Management process (HRM)

See references [1], [2], [5], [6], and [8] to [12].

The hazard/risk management process is an integral part of SMS and is the core of managing operational risks to acceptable levels. The level of risk that is considered acceptable is based on external and internal requirements and objectives, and availability and effectiveness of risk measures, considering also the resources available and required to manage risk to desired levels. Regardless of the size of the operator, its SMS is required to include a HRM Process. This section outlines basic guidelines for Member and operator HRM.

Note that in some countries, the term Safety Case has legal or regulatory implications and is used to describe most aspects of HRM. Likewise, the term **ALARP**, As Low As Reasonably Practicable, may locally have legal or regulatory implications. Local legal or regulatory may determine how HRM is applied and the risk objectives that are set.

4.1 The HRM process

In the absence of more stringent regulatory or Member requirements, Members and operators should document HRM and incorporate it into the SMS, including the following aspects of HRM.

The HRM forms an essential element in managing risk to as low as reasonably practicable (ALARP).

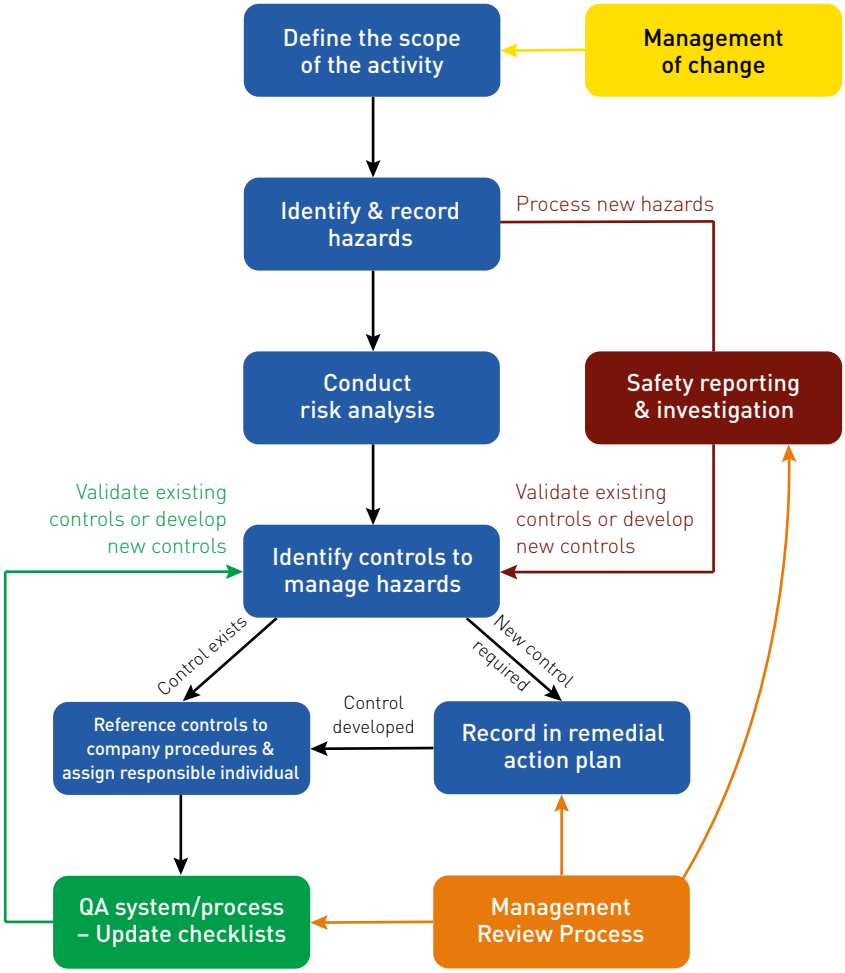

Figure 3: The HRM process

Regardless of the size of the operator, its SMS is required to include a HRM. Although the systems and procedures used will vary by operator and need to be aligned to complement the other elements of the SMS, the HRM Process should contain the elements and links shown below. Like the SMS, the size and complexity of the elements is likely to reflect the size and complexity of the operator.

The HRM must identify and address both generic, mission specific and location specific hazards. The hazards should be recorded in a hazard register in a format that:

- shows the risk assessment score assigned to each hazard;
- links the hazards to specific controls and recovery measures. See the bow tie model in 4.5 (Risk Management)
- provides a document reference for the control and recovery measure;
- assigns a responsible individual to each control.

The hazard register can be within the SMS Manual, in an appendix, in a separate document or in a software tool, as suits the operator.

An operator may have one generic hazard register covering its whole operation or a number of location or mission specific hazard registers. In either case, controls identified for location specific hazards are to be assigned local responsibility.

The HRM should be demonstrably linked to the operators Safety Reporting and Investigation process, its Management of Change process, and to the QA function. This ensures that the hazard/risk management process is triggered by reported incidents and occurrences, by relevant changes within the company, and that the controls developed by the process are verified by QA audit and by the investigation process. Those parts of the process indicated, should also be subject to periodic management review.

HRM is formally applied strategically, but should also include a tactical level by which tools and methodologies are developed and deployed for use by operational and maintenance personnel and other staff in safety-critical roles. Examples include 'Task Risk Analysis' (TRA) or 'Job Safety Analysis' (JSA) for repetitive activities, Line Operations Safety Audit (LOSA) and 'Threat and Error Management' (TEM), to identify and manage hazards and risks as they arise during operations. These tools should also feedback into the formal HRM process.

4.2 Risk assessment

Risk is the **product** of **potential consequence** (e.g. fatalities, asset loss, environmental damage) and **probability** (frequency or likelihood of the consequence).

Risk assessment is the act of judging and classifying the potential consequences and the likelihood of realising the consequences of hazardous events.

Operators and Members should use an agreed form of risk matrix to similar to the one depicted in Figure 4 to assess risk. The same risk matrix should be throughout the company.

Consequence					Increasing likelihood				
					A	B	C	D	E
Severity	People	Assets	Environment	Reputation	Never heard of in E&P industry	Heard of in E&P industry	Incident has occurred in our company	Happens several times per year in our company	Happens several times per year in a location
0	No health effect/injury	No damage	No effect	No impact					
1	Slight health effect/injury	Slight damage	Slight effect	Slight impact					
2	Minor health effect/injury	Minor damage	Minor effect	Limited impact					
3	Major health effect/injury	Localized damage	Localized effect	Considerable impact					
4	PTD or 1 to 3 fatalities	Major damage	Major effect	National impact					
5	Multiple fatalities	Extensive damage	Massive effect	International impact					

Low risk

Medium Risk

High Risk

Figure 4: Sample risk assessment matrix

In this sample matrix:

- the vertical axis displays the potential consequence of an incident
- the horizontal axis displays the likelihood or probability of this consequence.

Risk assessment matrices may use the opposite display for depicting likelihood in the vertical axis and consequence in the horizontal axis.

The number of columns and rows may vary. However, a 5 × 5 matrix should be considered the minimum useful number of rows and columns. The product of potential consequence and likelihood defines the risk classification.

4.3 Potential consequence

Risk should be assessed as:

- **Actual**. what the consequences of the incident
- **Potential**. what the consequences of the incident could have been.

In this sample matrix, Consequence is divided into levels running from '0' to '5', indicating increasing severity. A potential consequence should be reasonable and credible; something that could have developed upon the release of the hazard. It is very important to judge the potential consequences in addition to the actual ones. These are defined as the consequences that could have resulted from the released hazard if circumstances had been less favourable.

The overall potential consequence of an incident is established for four different scenarios. These are **People**, **Assets**, **Environment** and **Reputation**. A combination of these is possible, but the highest potential consequence is normally used for further analysis

4.4 Likelihood

Likelihood is also divided into five levels, which run from 'Never heard of in E&P industry' to 'Happens several times per year in a location.' The likelihood is estimated on the basis of historical evidence or experience. In other words: 'Has the potential consequence actually resulted from a similar incident within the aviation industry, the company or at the location?' Actual consequences have, by definition, occurred and hence fall on Likelihood C, D, or E on the risk matrix for the actual consequence level.

Note: this should not be confused with the likelihood that the hazard is released – we are concerned with the likelihood of the potential consequences resulting from the incident in question.

4.5 Risk management

As referenced in 4.1 (The HRM process), a **bow tie** can be used as a graphic depiction of a risk event, its potential causes, potential consequences, and the actual risk control or recovery measures (also known as risk barriers) that are in place to reduce likelihood of the event from occurring (left side), or reduce severity of the consequences (right side).

It is a structured approach to help manage risks to acceptable levels, as well as to communicate risk and even to assist in incident investigation. The bow tie method is an industry best practice, but it is not necessary to use it, and other methods (e.g. tabulated) of displaying the risk management process may be employed.

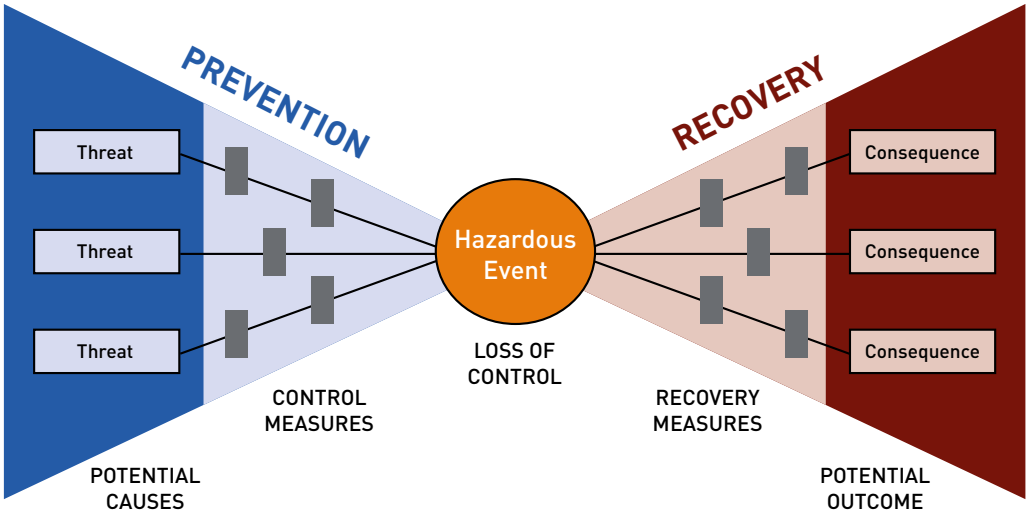

Figure 5: Schematic of a bow tie

A bow tie should concisely document the barriers and controls in place to prevent the release of a hazard and the recovery measures in place to minimize the consequences should the hazard be released.

Cross-references should be provided to link the reader to any other documents that define processes and procedures used to ensure the effectiveness of these barriers, controls, and recovery measures.

Effectiveness of measures/barriers should be assessed. Effectiveness should be based on demonstrated performance. Where barriers and controls depend on human actions, they should be complemented by training and competence assurance processes.

Bow ties not only assist in proactively identifying the barriers, controls and recovery measures necessary to manage risks, they offer a frame of reference for understanding how hazardous events (incidents and accidents) occur and for refining the barriers, controls and recovery measures to prevent recurrence. Used in this way, bow ties can be continuously improved with experience.

Several points should be considered in evaluating opportunities to reduce risks including, codes and standards, best practices, expert judgment, risk-based analysis (e.g. quantitative risk assessment), company values and societal values.

Industry Guidelines on a Framework for Risk Related Decision Support [11] gives an excellent description of how these factors should be considered in various decision contexts. ISO 17776 [12] is also a useful industry-specific reference document.

If bow ties should be used as part of an HRM system, they should be referred to as part of the overall SMS and tied to accident, incident follow up, the remedial action plan and the operator QA processes.

5 Incident and accident reporting requirements

See ICAO's Annex 13, *Aircraft Accident and Incident Investigation* [13] for standards and recommended practices on the conduct of aircraft accident and incident investigation.

Notwithstanding the air operator's regulatory, local and/or national legislative Mandatory Occurrence Reporting (MOR) obligations, Members should, by contract, require that owned and contracted aircraft operators provide notification and relevant available details to the Member (within 24 hours) in the event of the following occurrences:

a) Aircraft Accident

b) Serious or Significant Incident

c) Near Miss

d) Air Safety Reports (having imminent Airworthiness or Safety of Flight implications).

Aircraft accidents and serious incidents will normally be notified, investigated and reported in accordance with the international standards and recommended practices contained in reference [13], which provides the necessary framework for the investigation.

Members may choose to observe and participate if allowed by the State of Occurrence, and specialist assistance may be provided by the Member's Aviation Advisor to local in-house investigations.

IOGP's Health & Safety Incident Reporting System Users' Guide should also be consulted to determine if injuries sustained in the course of Members aviation related activities are reportable to the IOGP.

5.1 Accident – definition

For the purposes of consistency across different national regulatory authorities and to enable accurate statistics to be compiled, the following definition of accident, taken from ICAO, is assumed for all IOGP reporting purposes:

"**Accident** – An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked or, in the case of an unmanned aircraft, takes place between the
time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

a) A person is fatally or seriously injured as a result of:

   1) Being in the aircraft, or

   2) Direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or

   3) Direct exposure to jet blast or rotor downwash, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) The aircraft sustains damage or structural failure which:

   1) Adversely affects the structural strength, performance or flight characteristics of the aircraft, and

   2) Would normally require major repair or replacement of the affected component

   3) Except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tyres, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear and those resulting from hail or bird strike (including holes in the radome); or

c) The aircraft is missing or is completely inaccessible."

Because the ICAO definition is aimed primarily at fixed-wing flights terminating on land, the following is added for clarity over the particular area of ditching or water landing:

> "Where the aircraft intentionally or unintentionally ditches or lands on water as the result of a mechanical/system failure or aircrew error, and the aircraft cannot regain flight or is not subsequently recovered without sustaining the damage detailed in b) above, it will be considered an accident for the purposes of the IOGP aviation safety statistics."

For example, a ditching that resulted in a subsequent, but not necessarily immediate, rollover and/or sinking and major repair due to water damage, would be considered an accident for IOGP statistics. A ditching where the aircraft remains upright on its floats and is recovered with only minimal damage, including the damage due to water ingress, would not be considered an accident, unless paragraph a) applied.

5.2 Incident – definition

An **Incident** is defined as an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

5.3 Near Miss – definition

A **Near Miss** is defined as a narrowly avoided event having safety implications to all types of (aviation) operations.

6 Quality Assurance (QA)

Members should require aircraft operators to develop, document and implement an independent Quality Assurance (QA) system (or process) and designate a Quality Manager, to monitor compliance with and to provide assurance, that the controls specified through regulation, company operating procedures and the SMS process (as described in section 3) are effective within all flight operations, ground operations, maintenance and continuing airworthiness activities.

This should include:

a) an independent internal evaluation/audit programme encompassing all safety and quality critical activities within flight operations, ground operations, maintenance and continuing airworthiness activities, including all sub-contracted activities

b) all audits are carried out by competent personnel not responsible for the function, procedure or products being checked. All personnel should have a defined training programme and be competency checked on a routine basis

c) auditing of processes, procedures, documentation, training and records

d) aircraft audits (on a sample basis) should be included in the audit plan

e) audit activities should be scheduled and conducted at planned intervals to establish conformity with regulatory and management system requirements. Results of previous audits, including implementation and effectiveness of corrective action, should be included within the scope of the programme

f) an audit report should be compiled each time an audit is carried out. The report should describe what was checked and show the resulting findings against applicable regulation, requirements and internal procedures

g) the audit reports should be sent to the relevant department for action giving target rectification dates. Following finding rectification, the department should be required to inform the Quality Manager of the corrective action taken. Finding rectification should be based on root cause analysis

h) the programme should be managed at the local operational level and be subject to periodic review by the air operator's management. QA departmental procedures, duties, responsibilities and reporting relationships should be described in the Operations Manual, Maintenance Management Manual (MMM), Management System Manual or a separate QA manual as appropriate

i) performance indicators to judge the effectiveness of the programme

j) the process should include a direct feedback system to the Accountable Manager to ensure that findings are timely and effectively processed.

7 Environmental management

Environmental management controls should be in place to prevent damage to land and water by any means, prevent fires and air pollution, etc., and limit the effects of aircraft noise.

Environmental management controls should at all times be in compliance with local and or national regulatory requirements.

8 Emergency Response Planning

See *EHEST-SMS-Emergency-Response-Plan* [14] for guidance on developing an ERP.

8.1 Introduction

Each Member's site, operation or asset using aviation services should include aviation emergencies in their Emergency Response Plans (ERP) and identify appropriate responsible persons and the actions they should take in the event of an aviation emergency. The ERP should be developed in cooperation with the aircraft operator to ensure that in the event of an aviation emergency the response is swift, organized and efficient.

Both the Member's and the aircraft operator's ERPs should be regularly reviewed and modified when affected by regulatory, operational requirement changes or as the outcome of findings resulting from exercises.

Member's contracted aircraft may also be used to respond to non-aviation emergencies such as oil spills, medevacs and evacuations. These scenarios should also be covered in the relative ERPs.

8.2 Aviation emergencies

An aviation emergency could be:

a) any aircraft missing or overdue

b) aircraft accident on or in the vicinity of a Member owned airfield or heliport/helipad onshore

c) aircraft accident on or in the vicinity of an airfield or heliport/helipad onshore owned by another party

d) aeroplane accident en route

e) helicopter accident en route both onshore and offshore

f) helicopter crash on a helideck

g) helicopter ditching adjacent to an offshore facility.

8.3 Aircraft Operator's ERP

Contracted aircraft operators should have a comprehensive, organization wide ERP that covers appropriate emergencies from the list in 8.2, in addition to those listed in *EHEST-SMS-Emergency-Response-Plan* [14] which provides guidance on the development of an ERP. Note that [14] was developed for helicopter operations, but is equally applicable to aeroplane operators.

It may be necessary for the operator to have specialized ERPs for different bases or specialised activities (e.g. geophysical survey).

The use of flow charts for describing the emergency process and detailed check lists for each position of responsibility greatly assists in ensuring that all required actions will be addressed.

8.3.1 ERP exercises for Members and Aircraft Operators

Scenario based emergency exercises (also known as drills) with specific objectives should be conducted within 30 days of a new project start and at least annually for ongoing operations. At the conclusion of each exercise the drill should be critically assessed and all personnel fully debriefed. Lessons learned from the practice should be used to update and improve both the Member's and the operator's ERPs.

The scale of practices may run from an internal desktop exercise to one that involves all the players and resources that would participate in a real event, including the Member and State authorities (ATC, fire, marine, etc.), where possible. The drill should be integrated with the Member's marine and/or land surface resources and primarily used to test communications at all levels.

Practices should be held to exercise any of the emergencies listed in section 8.2 of [14], or:

a) search & rescue operation with use of emergency equipment to include linked raft rescue system, if available

b) helicopter winching exercises

c) oil and fuel spill – air support and spray bucket.

8.3.2 Planning for an emergency drill

Both the aircraft operator and the Member should combine to produce a documented plan for the safe conduct of emergency drills prior to the start of any exercise. Safety restrictions in conducting a drill might come from night operations and weather considerations, taking into account visibility, wind speed, temperature limits and sea states.

To validate the integrity of the specific scenario drill, the exercises should be varied with regard to the time of day and the day of the week. When applicable to the activities of the Member's site, asset or operation, this should include after-hours operations and on weekends.

8.3.3 Bridging document

A bridging document should be produced prior to commencement of operations under the contract. The bridging document should describe the individual responsibilities of the Member and of the aircraft operator. Examples are: Members are likely to manage humanitarian assistance to affected passengers and their families through their HR department, while the aircraft operator will be rendering similar assistance to the aircraft crew, their families and their own staff, and it is important that a single message is given to the media and therefore agreement should be reached between the parties on the content of statements to the press and who is going to deliver them.

Essential elements of the bridging document include:

a) an up-to-date contact list

b) lines of communication between the parties should be clearly defined

c) individual and mutual responsibilities of the different parties with respect to:

    1) notification of external agencies

    2) coordination of humanitarian assistance

    3) how the media are to be managed

    4) liaison with accident investigators and emergency services

    5) medevac process

    6) secondary SAR authorization, if applicable.

Aircraft operators who use large aircraft and carry substantial numbers of passengers should consider contracting a specialist Disaster Recovery organization.

8.4 Overdue or missing aircraft

An indication that the satellite tracking signal from the aircraft has stopped for an unknown reason or the anticipated radio call has not been received should be investigated immediately. The initial response should be to contact the aircraft by any available means. Failing a positive response, the aircraft should be considered overdue and the ERP should be activated. Details of the exact procedure will depend on the circumstances and should be published in the ERP.

A checklist should be used from the first instance to ensure all appropriate actions are undertaken and all relevant information is documented.

9 Search and Rescue procedures (SAR)

9.1 Member responsibilities

The specific role and duties of all aircraft utilized in the event of an emergency should be documented in the Member's relevant ERP.

Particular attention should be paid to clearly outline communication procedures between aircraft and the marine vessels and/or ground resources involved.

9.2 Operator responsibilities

Where aircraft are designated for emergency response standby, the aircraft and crew should always be in a situation that allows the response time agreed between the operator and the Member to be met.

Any change in the state of readiness of the aircraft or supporting emergency response equipment should be reported to relevant Member personnel immediately.

9.3 Planning considerations

SAR capabilities by both aircraft and vessels are significantly limited at night. This should be taken into account if late afternoon or night flights are undertaken.

The Member's Aviation Advisor should be contacted regarding guidelines and suitable aircraft for night SAR flights.

9.4 Helicopters used in a Secondary Search & Rescue role

For guidance on helicopters used in a Secondary SAR role, refer to AMG 590-S5, *Specialized operations: Hoisting* [15].

10 Search and Rescue (SAR) services and equipment

Should a Member decide to provide its own SAR service, then the aircraft operator should be equipped as necessary with SAR supportive equipment and be backed by an appropriate level of rescue service that can be directed to the operating area without delay.

The Aviation Advisor can assist with determining which equipment and services may be necessary.

Factors to be considered include the following:

a) environment hostile versus non-hostile. See AMG 590-D, *Aircraft operations* [16], 1.7.2 (Operating environment and weather)

b) anticipated survival time of occupants versus anticipated rescue time

c) local agency support

d) SAR support equipment. See AMG 590-G, *Recommended aircraft and personal equipment* [17], 3.6 (SAR support equipment for helicopters).

11 Medical and other emergency evacuation flights

11.1 Planning

Members whose activities are conducted in remote areas should, as part of an ERP, provide a clear set of instructions on arranging and obtaining emergency flights for technical, political, security or medical reasons.

11.2 Contingency arrangements for Aviation Operators

If acceptable aircraft are not available in the country or region of activity, contingency arrangements should be made in advance with approved operators specializing in emergency flights and medical evacuation operations.

The option of auditing all the possible med-rescue aircraft operators around the world that are available to respond to an air ambulance flight is likely to be beyond the resources available to most Members.

However, where there is a dedicated aircraft operator that is approved and suitably equipped, then that operator should be used for the task, such as in the case where an injured person is evacuated from an offshore platform for which the Member has a contracted support helicopter.

Guidance for air ambulance operations is given in TP10839E, *Guide to Air Ambulance Operations* [18] and section 12 (Helicopters used for medical evacuations).

At the time of requiring a medevac flight, the Member may not be able to pick and choose whose aircraft will be called to respond and therefore is forced to accept the service as provided. The only alternative would be to use local medical facilities, or wait for scheduled airline flights: neither of these options may be practicable or acceptable for real medical emergencies in remote locations where the medical support is less than the desirable standard.

Therefore, the following process should apply:

a) Controls should be in place to ensure that the Member's management and medical advisors only call for medevac flights when the level of illness/injury warrants the evacuation of the patient. These controls should form one part of the Emergency Response Plans for the operation or site. The use of available aircraft is accepted on the basis that the exposure and risk of using unaudited/unapproved aircraft is outweighed by the risk of further suffering or loss of life to the patient who is the focus of the medical emergency.

b) Wherever possible, contracts should be in place with medevac service companies such as those with known international reputations.

12 Helicopters used for medical evacuations

12.1 General

Medical evacuation (medevac) flights conducted as part of a standard onshore or offshore contract may be considered an extension of normal flying activities.

However, they can carry a number of risks which are not part of the day-to-day operation:

a) pressure on the aircrew to complete the task to save life and limb. Such pressure can arise within the crew themselves or be applied by external parties

b) inadequate preparation of the aircraft in that the patient is not properly restrained and the medical equipment is not secured

c) the medical crew is not properly prepared for flying

d) helicopter improperly equipped for type of flight to be undertaken: night, mountain, over water.

In order to mitigate these risks, aircraft operators expected to conduct medevac flights should proactively develop a mission risk assessment form for operations in their specific area, which should be completed by flight crews and the appropriate management before any medevac flights.

12.2 Protocols for medevac requests

A clear set of protocols should be established for requesting an aircraft for a medevac flight, particularly at night.

Only a limited number of responsible people should be involved and they should be aware of the risks associated with night flights. They should also be aware of their company's guidelines, particularly for helicopters offshore.

Approval for the flight should be a team decision involving the medic at the facility requesting the medevac, a doctor familiar with medevacs by air (if the medic is not a doctor), the Facility Manager, the Duty Manager, and the aircraft operator's Operations Manager or Chief Pilot as well as the flight crew.

Clear lines of communication should be established to ensure that time is not wasted in approving the flight.

Flights by day are not likely to incur additional risk if the flights are called to known operational areas, but requests for flights to previously unknown areas will involve additional levels of risk and as such should be treated with appropriate caution.

All requests for a night flight should be treated with caution. Consideration should be given to providing sufficient medical support at the facility in order to permit patient stabilization throughout night hours in order to reduce the requirement for night medevacs. It is recommended that the criteria for a medevac flight at night should be not lower than 'loss of life or limb'.

12.3 Pilot responsibilities

Pilots are responsible for the safe and efficient conduct of the flight, and this should be their primary focus.

Pilots should be encouraged to suppress any self-induced feelings that the medevac must be completed at all costs. They should be given the support necessary to refuse to take risks when asked to do so by other parties who do not understand the flight situation and whose focus is saving the patient.

Pilot training should include this aspect. See AMG 590-G, *Personnel qualifications, experience and training* [19], section 4 (Aircrew and medical attendant training for medical evacuations).

12.4 Medical attendant responsibilities

Medical attendants are responsible for the care of the patient. They are subordinate to the pilot in all matters concerning the conduct of the flight.

Whilst their assistance with the conduct of the mission is undoubtedly of value, advice or comment should be carefully considered before speaking to the pilots. It is vital that the medical attendants do not allow their concern for the patient to translate into pressure on the aircrew to take actions that might jeopardize the safety of the flight. A delicate balance can exist between medical concerns and flight safety.

a) The number of medical attendants required to attend to a single patient is preferred to be two, but one is the minimum. Two offer better patient care and more hands to assist in patient evacuation in the event of a forced landing/ditching.

b) Medical staff used to support medevac flights should undergo initial and recurrent flight training on a periodic basis. See AMG 590-G, *Personnel qualifications, experience and training* [19]. If medical personnel who have had no chance to undergo flight safety training are required to fly, then they should be accompanied by a person trained in aviation safety procedures to ensure operations are conducted with a minimum of risk.

c) It should be noted that at times when an aircraft crew member is on board to provide logistical assistance in the cabin area during a medevac flight, they are not responsible for providing medical assistance unless they are holding a suitable certification/qualification.

d) Unlike a dedicated medical service, the medical attendants for an ad hoc medevac are considered passengers and not crew members. Whenever possible, only a small number of suitably qualified medical staff should be allocated to medevac duties. This reduces the amount of training required, creates a better chance that an aviation trained medic/doctor is on the flight and reduces the despatch time due to a shorter briefing period. Medical staff will also be more familiar with the treatment of patients in the aircraft environment if the number of qualified persons is kept to a minimum.

12.5 Hot loading and unloading (rotors turning)

Hot loading/unloading of patients is not recommended. If hot loading/unloading is considered, it should be subject to a rigorous risk assessment.

It should only be performed:

a) under the most dire of emergencies, and then only after full consultation between the pilot and medical attendants

b) if the operation is strictly controlled in accordance with the helicopter operator's procedure.

The helicopter operator should develop a procedure for hot loading/unloading and all personnel involved should be fully trained in that procedure. Untrained personnel should not be used.

12.6 Hoisting

In some scenarios, medical evacuations may require hoisting injured or sick personnel into the helicopter. In these cases, the guidelines for hoisting operations in AMG 590-S5, *Specialized operations: Hoisting* [15] should be followed.

References

Only the latest version of a reference should be used.

[1] ICAO. Annex 19 to the Convention on International Civil Aviation. *Safety Management*. Incorporates safety management provisions from other ICAO Annexes into this new one.

[2] ICAO. *Safety Management Manual*. Doc 9859-AN/474.

[3] ICAO. Annex 6 to the Convention on International Civil Aviation. *Operation of Aircraft*. It requires that States, as part of their State Safety programme, shall require an operator to implement a safety management system.

[4] EASA IR-Ops Annex III, ORO.Gen.200. For establishment of a management system incorporating risk management.

[5] FAA. Advisory Circular AC 120-92A. *Safety Management Systems for Aviation Service Providers*.

[6] FAA. Advisory Circular AC 150/5200-37. *Introduction to Safety Management Systems (SMS) for Airport Operators*.

[7] FAA. Advisory Circular AC 120-59A, *Air Carrier Internal Evaluation Programs*.

[8] Transport Canada – Advisory Circular AC 107-0001. *Safety Management Systems.*

[9] CASA – Safety Management Systems Information Pack.

[10] UK. CAP1059. *Safety Management Systems: Guidance for small non-complex organisations.*

[11] OGUK. *Industry Guidelines on a Framework for Risk Related Decision Support*.

[12] ISO 17776, *Petroleum and natural gas industries – Offshore production installations – Guidelines on tools and techniques for hazard identification and risk assessment*.

[13] ICAO. Annex 13 to the Convention on International Civil Aviation. *Aircraft Accident and Incident Investigation.*

[14] *EHEST-SMS-Emergency-Response-Plan.*

[15] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S5, *Specialized operations: Hoisting.*

[16] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[17] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[18] Transport Canada. TP10839E. *Guide to Air Ambulance Operations*. Available from http://www.tc.gc.ca/eng/publications-menu.htm – search for TP10839.

[19] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training*.

Version 1

590-C
Personnel qualifications, experience and training

Purpose

The purpose of this module is to provide guidance on the qualifications, experience and training of personnel engaged in the operation of aircraft.

Scope

This module covers the desired levels of qualifications, experience and training for pilots, maintenance personnel, aircraft crewmen, support and technical personnel and helideck staff.

It is applicable to all IOGP Members.

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1 Pilots

1.1 Qualifications and experience

Qualification, experience, initial and recurrent training are vital factors in reducing the risk level in flight operations and ensuring that high professional standards are set and maintained.

Pilots should be licensed and current in accordance with local regulatory requirements. The required experience levels are tabulated in Tables 1 to 4.

These tables detail the required qualifications and flying experience of pilots before they can fly Members' or Members' Contractor(s) personnel. Where these requirements cannot be met, a mechanism to obtain a dispensation providing mitigating factors should be set in place. Where this is requested, full details of an individual's experience and qualifications under the headings shown in the tables should be submitted to the Aviation Advisor for assessment and consideration prior to agreeing or otherwise issuing such a dispensation.

Some NAAs allow 'captaincy under supervision' (called Pilot in Command Under Supervision (PICUS) in this manual (or 'P1 U/S'), to count towards command time. The Aviation Advisor should provide guidance on the use of PICUS time. See 1.2 (Pilot in Command Under Supervision (PICUS) Flight Time).

In some countries, air taxi and helicopter pilots may not be entitled to an Air Transport Pilot's License (ATPL) or equivalent. If this is the case, a Commercial Pilot's License (CPL), or equivalent in the country of operation, is considered acceptable.

1.2 General requirements Pilot in Command Under Supervision (PICUS) Flight Time

Pilots may log PICUS time to meet the requirements of Command Flight Time in Table 3 and Table 4. In those countries where the regulator has an allowance for logging these hours, the operator should use the approved national programme.

In those countries where such a system does not exist, the operator may request approval from the Member's Aviation Advisor to develop a programme to allow logging PICUS time. The logged time as PICUS may be recognized as Command Flight Time in meeting the requirements of Table 3 and Table 4, provided:

a) the flight time is logged while flying in the Captain's designated position

b) the operator has control and supervision over the programme

c) the flight time is recorded in the pilot's training records

d) the programme is audited as part of the operator's SMS.

Table 1: Aircraft Commander and Co-Pilot qualifications

	Aeroplanes			Helicopters		Helicopters & Aeroplanes
	Over 5700 kg CTOM* & all jets [5]	**Turboprop <5700 kg CTOM***	**Piston engine <5700 kg CTOM***	**Multi engine >5700 kg CTOM***	**Multi engine <5700 kg CTOM***	**Single engine <5700 kg CTOM***
Total Hours Previous 90 days [1]	50 hours in 90 days, 10 in Type Aircraft					
Medical Certificate appropriate for License	Current for ALL					
Instrument ratings	Required to be tested at periods not exceeding 13 months (Instrument base checks should be at 6-monthly intervals)					
Night Recency Previous 90 days	3 cycles [2]					N/A
CRM or ADM, initial/refresher	Annual					
Dangerous Goods Awareness	Every 2 years [4]					
Experience in the Topographical area and in the Type of Operations Specified [6]	One-year experience in areas similar to that specified in the contract (e.g. Arctic, offshore, mountain, desert, jungle or international operations)					
Helicopter Linked Life Raft Systems				Annual		
Hoist, within 12-month period [3]				3 Cycles		
Helicopter Hook, within 12-month period [3]				3 Cycles		
Helicopter Underwater Escape Training (HUET)	Every 4 Years (All crew members operating offshore)					
Accident & Violation Record	2 Years Accident Free for Human Error Causes, subject to review by the IOGP Member Company					
Flight Engineers						
Licence	2nd Class Licence			2nd Class Licence		
Total flight hours	2,000			2,000		
Navigators						
Licence	1st Class Licence			1st Class Licence		
Total flight hours	2,000			2,000		
Minimum navigator hours	1,000			1,000		
* CTOM = Certified Take-off Mass						

Notes:

1. When 50 hours in previous 90 days is not met, a non-revenue check flight by a qualified company check pilot should occur.
2. One Night Cycle consists of a night take-off, approach and landing. For offshore helicopter operations, the cycles are to be conducted to an offshore installation or vessel, as appropriate. Night operations should require two IFR pilots, IFR multi-engine aircraft and IFR procedures. Night operations in single engine aircraft are should not be conducted. For extreme latitudes, an alternative acceptable level compliance can be achieved through the application of the provisions at 1.5.9.5 (Helicopter offshore night operations and training).
3. If equipped for Hoisting, one cycle consists of one complete winch (out/in) or for External Loads (Hook) one load pickup and reposition.
4. Every two years or in accordance with local regulatory requirements.
5. Crew operating aeroplanes on long term contract operations with pressurized hulls should attend a one-time hypoxia course.
6. Co-pilots with less than one year of similar topographical experience may be used if following their initial ground school and competence based simulator courses, these co-pilots perform in the aircraft, and under the supervision of a Check and Training Captain the following, which should also be included in the Training Manual or other suitable document and documented upon completion of each task in the individual pilot training records.
   a) Fly as an observer in the jump seat or as a crew-member on a non-revenue flight for at least one flight into each of the airfields/helipads used regularly for operations, prior to the new co-pilot acting as a crewmember in the co-pilot's seat; and
   b) 5 role representative (confined, high DA helipads, helidecks, contaminated runways, etc.) takeoffs and landings by day prior to flying on line in the co-pilot seat by day; and
   c) 5 takeoffs approaches and landings by night, prior to flying on line in the co-pilot seat by night (if applicable); and
   d) Fly in the co-pilot's seat with a Check and Training Captain or Line Training Captain for at least the first 50 hours on line; and
   e) Successful completion of a full co-pilot flight evaluation flight for suitability as a line co-pilot after completion of the above.

1.3 Pilot relevant role experience

Table 2: Aircraft Commander experience requirements

Aeroplanes	Helicopters	
Where specialist activities are involved, such as airborne pollution control, top dressing and aeromagnetic surveys then advice on specialist experience requirements should be sought from a qualified Aviation Advisor	Land Seismic Operations	See IOGP Report 420, *Helicopter guidelines for land seismic & helirig operations* [1].
	Winching	A formal and recorded training scheme should have been undertaken which includes 10 hours of dedicated winching operation sorties (50 hours where an exclusive SAR winch operations contract is in place) and be qualified under offshore or land seismic operations as appropriate above. Recurrent training requirements are 3 winch rescue operations every 90 days. See AMG 590-S5, *Specialized operations: Hoisting* [2]
	Aeromagnetic and geophysical Survey Operations	See AMG 590-H, *Airborne geophysical* [3].
	Offshore spraying/Pollution control	Prior offshore experience. Details in each case should be agreed with a qualified Aviation Advisor.
	Recent role experience	For all the above role requirements, recent experience is considered essential, and pilots who have not operated in any of the relevant categories for periods in excess of a year should require refresher training [more frequent in the case of winching]. Advice should be sought from a qualified aviation Advisor.

Table 3: Helicopter Pilot experience and qualification levels

	Helicopters Certified to FAR-27, FAR-29, CS-27 or CS-29		
	FAR-29 / CS-29 certified	**FAR-27 / CS-27 certified multi-engine**	**FAR-27 / CS-27 certified single-engine**
Aircraft Commander Qualifications			
Licenses	ATPL(H)	ATPL(H)	CPL(H)
Type rating on contract aircraft	Current	Current	Current
Instrument rating on contract aircraft [1]	Current	Current	Current [2]
Aircraft Commander Experience not less than			
Total hours helicopter	3000 [6]	2,000	1,500
Total hours in command [3]	1,500	1,000	1,000
Total hours in command – multi-eng [3, 4]	1,200	500 [7]	—
Total hours in similar aircraft complexity [3, 4]	500	500 [7]	—
Total hours in command on contract type [7]	100	100	100
Co-Pilot Qualifications			
Licenses	CPL(H)	CPL(H)	CPL(H) [5]
Type rating on contract aircraft [1]	Current	Current	Current [2]
Instrument rating on contract aircraft	Current	Current	Current
Co-Pilot Experience not less than			
Total hours	500	500	500
Total hours on multi-engine aircraft [3]	500	250	—
Total hours in command of multi-engine aircraft [2,4]	—	—	—
Total hours in command [3]	100	100	100
Total hours on contract type [3,7]	50	50	50

Notes:

1. Instrument ratings are required to be tested at periods not exceeding 13 months. (Instrument base checks should be at 6 monthly intervals).
2. Requirement for Instrument Rating depends on role or task. However, in all cases, proven and current instrument competence (i.e. inadvertent IFR recovery training) is required.
3. These hours to be fully on either aeroplanes or helicopters as appropriate. Up to 10% may be achieved in a flight simulator approved for the purpose by the regulatory authority. For Jets, 50% should be in Jet Command
4. For Pilot in Command Under Supervision multi-engine requirements see 1.2. Co-pilots, who do not meet 100 hours captain experience, may be used provided that each co-pilot has successfully completed the following training which is documented in the pilot's training records:
   - An approved aircraft endorsement course for the aircraft type; and
   - A technical, emergencies and CRM course at the appropriate type-specific flight simulator prior to commencing operational flight operations; and
   - 50 flight hours of supervised operational flights with an approved Training Captain; and
   - A successful Line Check flight by a different Check and Training Captain.
5. It is unlikely that a co-pilot will be required.
6. Total hours may be reduced by 1000 hours when total hours in similar aircraft complexity exceeds 1000 hours and no dispensation has been granted in the other Aircraft Commander Qualifications.
7. For all aircraft types, dispensation can be given for Total hours in command on contract type, when a pilot has completed an Aircraft Type Conversion course, based on the guidelines in this module and accepted by the IOGP Member Company. For Helicopters under 3175 kg dispensation can also be given for Aircraft Commander Total hours in command multi engine and Total hours in similar aircraft complexity when a pilot has completed an Aircraft Type Conversion course, based on the guidelines in this module and accepted by the IOGP Member Company.

Table 4: Aeroplane Pilot qualifications and experience levels

	Aeroplanes (CTOM = Certified Take-off Mass)			
	Aeroplanes >5,700 kg CTOM[1]	Turbine-powered ≤5,700 kg CTOM; Turboprop certified with 19 pax seats or less	Piston multi-engine ≤5,700 kg CTOM	Single engine ≤5,700 kg CTOM
Aircraft Commander Qualifications				
Licenses	ATPL	ATPL	CPL	CPL
Type rating on contract aircraft [2]	Current	Current	Current	Current
Instrument rating on contract aircraft	Current	Current	Current [3]	Current [3]
Aircraft Commander Experience not less than				
Total hours [4]	4,000 [5]	3,000	1,500	1,500
Total hours in command aeroplane [4, 6]	2,500	1,500	1,000	1,000
Total hours in command/PICUS – multi-eng aeroplane [4, 6]	2,000	1,200	750	—
Total hours in similar aircraft complexity [4, 6]	500	500	—	—
Total hours in command on contract type [4, 7]	100	100	100	100
Co-Pilot Qualifications				
Licenses	CPL	CPL [8]	CPL [8]	CPL [8]
Type rating on contract aircraft [2]	Current	Current [8]	Current [8]	Current [8]
Instrument rating on contract aircraft	Current	Current [8]	Current [3, 8]	Current [3, 8]
Co-Pilot Experience not less than				
Total hours aeroplane [4, 9]	1,000	500	500	500
Total hours on multi-engine aeroplane [4, 9, 10]	500	250	250	—
Total hours in command on multi-engine aeroplane [4, 9, 11]	100	—	—	—
Total hours in command/PICUS aeroplane [4, 9, 11]	—	100	100	100
Total hours on contract type [4, 9]	50	50	50	50

Notes

1. The requirements for Turboprop below 5700 kg also apply to the following types that have a CTOM above 5700 kg: King Air 300, Fairchild Metro III/23, SC-7 Skyvan, Let 410/420, AN 28, Skytruck 28 & Dornier 228 series aircraft.
2. In case of multi crew operation, the type rating should include the multi-crew license endorsement as appropriate.
3. Requirement for Instrument Rating depends on role or task. However, in all cases, proven and current instrument competence (i.e. inadvertent IFR recovery training) is required.
4. These hours should be fully on aeroplanes. Up to 10% may be achieved in a flight simulator approved for the purpose by the regulatory authority. For Jets, 50% should be as Pilot in Command of jet aircraft.
5. Total hours may be reduced by 1000 hours when total hours in similar aircraft complexity exceeds 1000 hours and no dispensation has been granted in the other Aircraft Commander Qualifications.
6. For Pilot in Command Under Supervision multi-engine requirements, see 1.2.
7. For all aircraft types, dispensation can be given for 'Total hours in command on contract type', when a pilot has completed an Aircraft Type Conversion course, based on the guidelines at 1.5.6 and accepted by the Member.
8. If applicable/required for the contracted aircraft.
9. For *ab initio* co-pilots which do not meet these hours, the specific dispensation policy is addressed in Table 5.
10. Co-pilots who are not *ab initio* and do not meet the 500 or 250 hours ME experience for the specific category, may be used with 100 or 50 hours respectively provided that they have successfully completed all of the following training, which is documented in the pilot's training records: • An approved aircraft endorsement course for the contracted aircraft type; • A technical, emergencies and CRM course in the appropriate type-specific flight simulator prior to commencing operational flight operations; • Until reaching 100 or 50 as appropriate flight hours ME all hours should be supervised operational flights with an approved training captain; • A successful line check flight by a different Check and Training Captain when ready to be released for revenue flights.
11. Co-pilots who are not *ab initio* and do not meet the 100 hours captain experience, may be used provided that each co-pilot has successfully completed all of the following training, which is documented in the pilot's training records: • An approved aircraft endorsement course for the contracted aircraft type; • A technical, emergencies and CRM course in the appropriate type-specific flight simulator prior to commencing operational flight operations; • 50 flight hours of supervised operational flights with an approved training captain; • A successful line check flight by a different Check and Training Captain when ready to be released for revenue flights.

1.4 Alternatives to IOGP recommended experience levels

As an alternative to the pilot experience levels detailed in Tables 3 and 4, it is possible to replace the requirement for defined pilot experience levels with an approved operator's competency based Training Management System. This can apply to either helicopter or fixed wing.

Table 5 is the model for helicopters but it can be used to develop a fixed wing plan with details of what is expected at each stage of training. To avoid abuse of this alternative, the Member and the operator should have an agreed proposal of what will be completed and how it will be measured.

There are only two entry points: *ab initio*, or Commercial Pilot License. There should be no other entry into the plan. This is to avoid the use of flight crews that do not meet certain hour experience overcoming the intent of bringing on true *ab initio* flight crews. Crews who fall short of meeting the hourly experience requirements of Table 3 and 4 should require a formal waiver from the contracting Member's requirements.

In order to approve a competency-based training system, the following conditions should be met:

a) establishment of a formal, modular, competency based progression scheme for pilots from basic (*ab initio*/new-hire/conversion) to command and for aircraft type conversion, which should be:

   1) be based on the guidelines at Table 5 and 1.5.6, as applicable

   2) include an ATPL Theory examination and elements for role specific training (i.e. off-shore, vertical reference, etc.) at the Stage 2 level for Commercial Pilot License (CPL) training

b) initial and ongoing 'in-depth' audits of the operator's training system and effectiveness of the implementation of the competency based training programme should be conducted by the Aviation Advisor to include the following as a minimum:

   1) content of the training syllabus, to include comprehensive ground and flight training, particularly for entry at the CPL stage (see d) below), based on the best practices from both the JAA and FAA training schemes

   2) formal progression scheme for pilots from *ab initio* to command. Observation of Crew Resource Management (CRM) and simulator programmes including Line Oriented Flight Training (LOFT)

3) examination of training records with emphasis on a structured command course, competencies to be achieved and the associated checking process

4) Base and Line training staff with defined competencies who themselves are regularly checked

5) ensure that the programme being offered meets FAA and/or EASA regulatory requirements for certification standards at the highest level of flight training

c) when a new aircraft type initially is introduced on contract, it may be necessary to reduce total time on type. This should be considered only after approval of the operator's type conversion scheme based on the requirements of 1.5.6, and should be reviewed on a case-by-case basis.

d) the entry level for the competency based Training Management System will normally be at the *ab initio* level (Table 5, Stage 1), but can also be with a CPL, in Stage 2 or 4. However, this should be defined and agreed with the Member's Aviation Advisor. When a candidate is selected to enter with a CPL the following conditions should apply:

1) individual aptitude testing is completed in accordance with Table 5, Stage 1

2) the candidate holds an ATPL theory qualification

3) full training records are held for the CPL training including records of stage and final check flights, and total hours are validated by the training provider.

Table 5: *Ab initio* and low experience Pilot training and progression for multi-crew offshore Helicopter Pilots [1,4,5]

Stage 1: Detailed pilot aptitude testing should be required prior to enrolment in the programme

This testing should include evaluation of language skills, cognitive abilities, hand-eye coordination, ability to apply theory and team coordination, etc.

⇩

Stage 2: CPL(H) training at an approved flight training school[2]

ATP theory required for operations on multi-pilot helicopters
Total experience 150 hours

⇩

Stage 3: IR(H) training at an approved flight training organization

35 hours flight time
Total experience 185 hours

⇩

Stage 4: CPLH/IR(H)

Individual may pass the entry process for company *ab initio* programme with CPL or can enter programme with CPL as result of structured recruitment process

⇩

Stage 5: Company approved training programme

a) Multi Pilot Type Rating Course 10 hr FS + 2 hr A/C
b) Multi Crew Co-operation Course 12 hr FS [3]
c) Type IR Course 5 hr FS + 2 hr A/C
d) Operator Conversion Course (hrs included in (b) and (c) above) Total 27 hours (A/C and FS).
Total experience 212 hours

Flight tests by different TRE
a) Combined VMC Licence Skill Test and OPC
b) Type IR Skill Test Total approx 3 hours

⇩

Stage 6: Non-revenue offshore deck landing training by day and night with TRE

a) WDD & HUET Training
b) Minimum 5 day and 5 night deck landings
c) Competence check for release to Line Training Minimum 5 flight hours
Total experience 220 hours

⇩

Stage 7: Line Training Ground Course

GPS Training, Performance, Flight Planning
Dangerous Goods Training
Simulator Line Flight or Jump Seat Line Familiarization

⇗

Stage 8: Line flying under supervision of a Line Training Captain (LTC)

a) Minimum 10 offshore landings to normal and small decks by day and night
b) 50 flight hours minimum
c) Progress report required for all flights.
Total experience 270 hour

⇩

Stage 9: Line check as co-pilot by different LTC

Approximately 3 flight hours
Should include and offshore landing and take off
Total experience 273 hours

⇩

Stage 10: Released to line

a) *Ab initio* pilots and CPL(H) holders with less than 1000 hours – with any commander who has no less than 500 hours PIC time including 100 hours on type
b) Co-pilots restricted to day operations unless fully night qualified.

⇩

Stage 11: Progressive monitoring on line as FO

a) 2 Qualifying Flight Reports per month with a Training Captain or LTC
b) Recurrent Training and OPC/LPC checks
c) 6-monthly progress reviews with training staff
d) Written records of above elements
e) After the co-pilot has 500 hours he can be released to any PIC.

⇩

Stage 12: Promotion to SFO

Approximately at the 2-year point – promotion board or management evaluation with CP, CTC SLTC Monitoring continues as above

Total experience approximately 1450 hours depending on operational rate of accumulation

⇩

Stage 13: Command Course (at approximately the 4 year point)

a) Minimum requirements – ATPLH, 2000 hours helicopter including 1000 as PICUS gained in accordance with the Operators procedures
b) Technical exam
c) RHS checks
d) FS or FTD 3 Training and Assessment
e) CRM assessment
f) Command Line Training
g) Command Line Check by different LTC
h) A letter of recommendation should be forwarded to the Member company prior to assignment.

⇩

Stage 14: Promotion to Command

Initially only qualified to fly in command with co-pilots who have 500 hours total experience including 100 hours on type until the new commander has accumulated 500 hours in command.

Notes

1. Operators may establish equivalent programmes for onshore operations, including airplanes, subject to acceptance by IOGP Member Companies.
2. The State approved flight training school(s) and curriculum should be to EASA/FAA or equivalent standards and successfully reviewed by the Member's Aviation Advisor. Pilots may be approved to enter the program with an existing CPL if their training programme meets 1.4.
3. For details on the Multi Crew Co-operation Courses refer to EASA approved flight training establishments
4. The programme should meet both FAA and/or EASA certification standards.
5. Detailed training records are to be maintained for all phases of the training programme.

These records should reflect the results of each training session and include the standards to which the pilot was able to complete the exercise or flight requirement.

1.5 Training

1.5.1 Training records and programmes

Aircraft operators should maintain comprehensive training documentation that includes details of the training programmes provided to their personnel and the required training frequency. Individual training records should be maintained for each person.

For long term or sole use contracts, aircraft operators should provide to the Member:

a) a list of personnel that meet the Member's requirements, and

b) details of personnel changes which should be reviewed and accepted by the Member's Aviation Advisor before they commence work.

Training records should be periodically reviewed by the Member's Aviation Advisor. The aircraft operator should make these records and its training programmes available upon request.

1.5.2 Reorientation flight after absence

Pilots should be subject to a 'reorientation' flight after an absence from flying for a period of 45 days or longer.

Preferably, a member of the Training Department will monitor such flight. However, if such person is not available, a Senior Line Pilot or Base Manager (if a pilot) may monitor the flight.

The intent is for pilots returning from extended time away to re-acclimate to the operational environment. In the case of single pilot aircraft, the flight should be conducted without passengers. The monitoring pilot should annotate the flight on the flight log record.

1.5.3 Recurrent training

All pilots should receive annual recurrent training to the standards of the NAA, and flight checks at not less than a frequency of every six months for long-term operations. These flight checks should include an annual instrument rating proficiency check/renewal (where applicable), an Operator Proficiency Check (OPC) which includes emergency drills and an annual Line Proficiency Check (LPC).

Where distinct climatic seasons exist, training related to the seasonal change is recommended.

Before being scheduled for flight duties in a new location, all crewmembers should undergo at least a documented orientation line check, including a review of local procedures and policies.

1.5.4 90-day currency

Each pilot should maintain 90-day currency by meeting any operator requirements as published and fly a total of 50 hours in the preceding 90 days. When this cannot be met, a line training flight administered by the operator's training department should be conducted. The line training flight is to determine proficiency for the environment and operations being flown; it is not intended to be conducted routinely at the end of every 90-day period.

In those cases where 90-day minimum requirements will not be met due to low contracted flight operational hours, a risk assessment with appropriate mitigation is to be presented to the Member's Aviation Advisor.

1.5.5 Use of Synthetic Training Devices (STD)

A Synthetic Training Device should replicate the model of aircraft being flown as closely as possible. It is preferred that the device be full motion with a visual screen that provides forward and peripheral imaging. For IOGP purposes, flight crews should be seated at normal flight control stations to receive credit for simulator time.

1.5.5.1 Categories

STDs fall into the following categories:

a) **Flight Simulator (FS)**. A full size replica of a specific type or make, model and series aircraft flight deck/cockpit, including the assemblage of all equipment and computer programmes necessary to represent the aircraft in ground and flight operations, a visual system providing an out of the flight deck/cockpit view, and a force cueing motion system. It is in compliance with the minimum standards for Flight Simulator certification.

b) **Flight Training Device (FTD)**. A full size replica of a specific aircraft type's instruments, equipment, panels, and controls in an open flight deck/cockpit area, or an enclosed aircraft cockpit/flight deck. The FTD should include the assemblage of equipment and computer programmes necessary to represent the aircraft in ground and flight conditions to the extent of the systems installed in the device. It does not require a force cueing motion or visual system for some levels of qualification.

c) **Flight Navigation Procedures Trainer (FNPT)**. A training device which represents the flight deck/cockpit environment including the assemblage of equipment and computer programmes necessary to represent an aircraft in flight conditions to the extent that the systems appear to function as in an aircraft. It is in compliance with the minimum standards for a specific FNPT Level of Qualification.

1.5.5.2 Applicability

Aircrew on sole-use, long term contracts should undergo training in an approved STD at a preferred frequency of every 12 months but not more than 24 months. Level C or Level D Flight Simulators should be chosen where available for the type.

Where a FS is not available for the aircraft type or where the configuration of the FS is not sufficiently representative of the contracted commercial aircraft, the use of FTDs as an alternative may be accepted by the individual Member company in accordance with the following guidelines:

It is recommended that STDs should include landing area visual simulations that are representative of those being used by the respective operator. For example, offshore simulation training should include helideck visuals with markings representative of those being used in daily operations.

a) FTD Level 3 standards or equivalent for medium rotorcraft above 3175 kg (7,000 lb)

b) FTD Level 2 for small rotorcraft with a maximum weight of 3175 kg (7,000 lb)

c) or less and certified with nine or less passenger seats.

See 1.5.9.5 for application regarding offshore training.

While it is recognized that the use of simulators allows practice in handling emergencies that cannot be practiced in the air, the emphasis of this training should be in the development of Crew Resource Management (CRM) for multi-crew aircraft or Aeronautical Decision Making (ADM) for single piloted aircraft, including practice of CRM/ADM principles.

When appropriate, this should be in the form of Line Oriented Flight Training (LOFT), the exercises for which should be developed between the aircraft and the simulator operators themselves to provide 'real time' exercises using simulated local operational, weather and environmental conditions.

1.5.6 Pilot aircraft conversion syllabus and minimum hours

Current IOGP guidelines specify 100 hours time on type for commanders and 50 hours on type for co-pilots. However, when introducing new types into service or when changing to alternate types, it may be more appropriate to have an integrated structured training programme. This should consist of a dedicated training package which, through the benefits of the training, would enable a reduction of the overall hours required (up to 50%), provided:

a) it is part of the formal manufacturer's recommended training programme, and

b) it is based on a completed training needs analysis, and

c) if applicable, it utilizes an FTD/FNPT which replicates the aircraft controls and systems, and is compatible to the full motion trainer being used by the manufacturer.

Content of this programme should be in accordance with Tables 3 and 4 and equivalent to 1.4. Further guidance is available from the Member's Aviation Advisor.

Tables 6 and 7 define the elements of the types of training to be completed in the introduction of the type into public transport service and the indicative hours required for each group of elements. An assumption made in building this training analysis is that as part of the initial training on the aircraft type to have his/her licence endorsed, the pilot should accumulate a minimum of 15 hours on type. It is recognized that there will be variations to this number in that some pilots may require additional hours, but the total flown will be credited.

The training should consist of a minimum of 25% in the simulator with a minimal amount of time spent in the aircraft as agreed upon by the Member company as per Table 7, unless simulators are not available and are excluded through a risk assessment.

Cockpit Procedural Trainers (CPT) for transition training into a new aircraft should replicate the cockpit environment, controls, depiction of switches, and avionic system for the aircraft to be flown. When using CPTs in the training plan, there should be clear explanations of how these devices will be used, but in no case should CPT time be used as a substitution for type simulator time.

The following guidance gives a breakdown of the training requirements for converting from one aircraft to another. The hours incurred during the initial conversion training will count towards the total defined for the class and type of conversion. The guidance herein defines the generalized model and does not consider every case with all possible variations.

Therefore, applications for specific variations by model/type should be submitted for consideration to the Member's Aviation Advisor for approval.

Table 6: Total conversion hours

Pilot Conversion Experience with Example Models		TRE/ TRI A	Captain & LTC B	Co-pilot C	Remarks
1	Non Series/derivative analogue type aircraft converting to glass cockpit, or glass cockpit to analogue (i.e. Bell 212 analogue cockpit to an EC225 with full glass cockpit)	80 hours (A1)	60 hours (B1)	60 hours (B1)	Includes the total hours accrued in achieving the type rating.
2	Series/derivative analogue type aircraft converting to glass cockpit, or glass cockpit to analogue (i.e. AS332L1 to an EC225, or SK 76A++ to an SK-76C++)	30 (A2)	20 (B2)	10 (C2)	Assuming greater than 150 on the original type. Co-pilot should fly with experienced line training captain with 500 hours on type or derivative type otherwise requires 15 hours.
3	Non-series/derivative type with glass cockpit converting to another glass cockpit (i.e. S76C+ to S92A)	70 (A3)	50 (B3)	35 (C3)	May include change in class of aircraft, e.g. small to large. Variant glass cockpits within a series should require a differences/familiarization training course.
4	Non series/derivative analogue type single engine aircraft converting to multi engine glass cockpit aircraft with MTOGW of less than 7000 lb, (i.e. Bell 206 analogue cockpit to an EC135 glass cockpit) or to SIC in a multi engine glass cockpit aircraft (i.e. Captain in Bell 206 to SIC in SK- 76C++ or AW 139)	80 (A4)	50 (B4)	50 (C4)	Assumes pilot has no previous multi-engine aircraft experience. Reductions in flight under supervision times may be made commensurate with previous multi engine aircraft time.

All hours listed in Table 7 are indicative and relevant to a generic pilot, but the sum total of the whole should equal the required total conversion hours detailed in Table 6. Subject to a training programme being submitted by the Training Captain, the listing below provides a guide to the exercises to be completed.

Hours suggested herein are not intended to exactly total the requirement, but to leave an element of latitude for the Training Captain to allocate to actual needs of the individual.

This table is a sample that might be used for helicopters; it can be modified as needed for aeroplanes and varying models/types of aircraft and should be approved prior to implementation by the Member's Aviation Advisor.

Table 7: Training elements and hours

	Training Location	A1	A2	A3	A3	B1	B2	B3	B4	C1	C2	C3	C4	Comments
Section 1: Pre-flight preparation and checks	**FS = Flight Simulator**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
Helicopter exterior visual inspection; location of each item and purpose of inspection	Aircraft													
Cockpit inspection	Aircraft													
Starting procedures, radio and navigation equipment, selection and setting of navigation and communication frequencies	Aircraft or FS													
Section 2: Flight manoeuvres and procedures		#	#	#	#	#	#	#	#	#	#	#	#	
Taxiing/air taxiing in compliance with air traffic control instructions or on instructions of an instructor	Aircraft or FS													
Ground handling - Incl rate of turn limitations	Aircraft													
Pre take-off procedures and checks	Aircraft or FS													
Takeoffs various profiles	Aircraft & FS													
Cross-wind take-off (if practical)	Aircraft or FS													
Take-off at maximum take-off mass (actual or simulated maximum take-off mass)	Aircraft or FS													
Take-offs with simulated engine failure														
– Shortly before reaching TDP or DPATO	Aircraft & FS													
– Shortly after reaching TDP, or DPATO	Aircraft or FS													
Turns	Aircraft & FS													
Landings, various profiles	Aircraft & FS													
Go around or landing following a simulated engine failure before LDP or DPBL	Aircraft & FS													
Landing following simulated engine failure after LDP or DPBL	Aircraft & FS													
Normal and abnormal operations of the following systems and procedures:														
Engine/FADEC	Aircraft & FS													
Air conditioning (heating/ventilation)	Aircraft & FS													
Pitot/static system	Aircraft & FS													
Fuel system	Aircraft & FS													
Electrical system	Aircraft & FS													
Hydraulic system	Aircraft & FS													
FMS	Aircraft & FS													
Flight Control and Trim System	Aircraft													
Anti and de-icing system	Aircraft & FS													

	Training Location	A1	A2	A3	A3	B1	B2	B3	B4	C1	C2	C3	C4	Comments
Autopilot/Flight Director	Aircraft													
Stability augmentation device	Aircraft													
Weather radar, radio altimeter and transponder	Aircraft & FS													
Area navigation system	Aircraft													
Landing gear system	Aircraft & FS													
APU (if applicable)	Aircraft or FS													
Radio, navigation equipment, instrument flight management	Aircraft & FS													
Turns with 30 degrees bank, 180 degrees to 360 degrees left and right by sole reference to instruments	Aircraft													
Section 3: Instrument Procedures (to be performed in IMC or simulated IMC)		#	#	#	#	#	#	#	#	#	#	#	#	As required for use of systems
Instrument take-off: transition to instrument flight is required as soon as possible after becoming airborne	Aircraft & FS													
Adherence to departure and arrival routes and ATC instructions	Aircraft & FS													
Holding procedures	Aircraft & FS													
ILS approach down to CAT 1 decision height	Aircraft or FS													
– Manually without a flight director	Aircraft & FS													
– Manually with flight director	Aircraft													
– With coupled autopilot	Aircraft													
– Manually with one engine simulated inoperative	Aircraft													
Non precision approach down to the minimum descent altitude MDA/H	Aircraft & FS													
Missed approach procedures	Aircraft or FS													
Go around with all engine operating on reaching decision height/MDA	Aircraft & FS													
Go around with one engine simulated inoperative on reaching decision height/MDA	Aircraft													
Autopilot degraded modes and SAS ops	Flight Simulator													
Airborne Radar Approaches	Aircraft													
Screen Failure management	Aircraft & FS													
Use of Standby instruments	Aircraft													
IMC autorotation with power recovery	Aircraft & FS													
Section 4: Additional general handling		18	5	15		10	2	10		10	Opt	7		
Left and right seat handling	Aircraft & FS													
Offshore Deck landings	Aircraft													
Fully coupled approaches	Aircraft & FS													

	Training Location	A1	A2	A3	A3	B1	B2	B3	B4	C1	C2	C3	C4	Comments
Use of upper modes	Aircraft & FS													
– Speed/climb/descent/manoeuvres	Aircraft & FS													
– Glass cockpit screen management	Aircraft & FS													
– Degraded mode operations	Aircraft & FS													
Section 5: Night flying														
Night Deck Landing	Aircraft													
Screens management	Aircraft and FS													
Rejected take-off	Aircraft													
Continued take-off	Aircraft and FS													
Night recency	Aircraft													
Night Competency assessment	Aircraft													
Section 6: LOFT and CRM		4	2	4		4	2	4		4	2	4		LOFT mandated requirement specified in hours and includes whole crew
Specified Loft Scenarios	Flight Simulator													One LOFT Exercise to include a Ditching
3rd seat CRM assessment flights	Aircraft													
Section 7: Navigation and Line flying exercises		4	Opt	4		4	Opt	4		2	Opt	2		
Navex to be conducted out of theatre	Aircraft													
Line flying experience conducted in theatre	Aircraft													
– to include cabin attendant integration where appropriate	Aircraft													
Section 8: Use of optional equipment														
HUMS/HOMP	Aircraft													As required for equipment installed on the contracted helicopter
EGPWS	Aircraft													
ACAS/ACAD	Aircraft													
Section 9: Systems familiarity and knowledge		22	8	15		15	5	10		5	Opt	4		
Abnormal and emergency procedures	Aircraft & FS													
Tail rotor control failure	Flight Simulator													
Tail rotor loss	Flight Simulator													
Fire drills	Aircraft & FS													
Smoke control and removal	Flight Simulator													
Engine Failures, shut down and restart at safe height	Aircraft													

	Training Location	A1	A2	A3	A3	B1	B2	B3	B4	C1	C2	C3	C4	Comments
Fuel Dumping	Flight Simulator													
Autorotation descent	Aircraft & FS													
Autorotative landing or power recovery	Aircraft & FS													
Incapacitation of a crew member	Aircraft & FS													
Other emergency procedures as outlined in the appropriate flight manual	Aircraft & FS													
Section 10: Special Task Operations														
Public Transport HHO (e.g. Marine Pilot transfer)	Aircraft													Only required where pilots under training will have requirement to carry out Special Task Operations, this can be part of the total training hours if the Training Captain agrees the student has reached the standard for additional development beyond the basic public transport operations but specifically may not use more than 10% of the total training allocation required for the class of pilot in Table 6 above
Underslung Loads	Aircraft													
Fire Fighting	Aircraft													
Secondary SAR	Aircraft													
Homing	Aircraft													
Search patterns	Aircraft													
Use of Night Sun	Aircraft													
Section 11: Phase checks														
Phase 1 – Test on Manoeuvres sections 1-12 (as applicable)	Aircraft or FS													
Phase 2 – Test on Manoeuvres Sections 1-12 (as applicable) plus LOFT scenario	Aircraft													
Phase 3 – Final Route Check	Aircraft													
Section 15: Flight Under Supervision if for single pilot aircraft (Revenue Flights)														
Define requirements for flight under supervision, prior to solo revenue flights	Aircraft													
Total time to be considered qualified in type		80	30	70	80	60	20	50	50	40	10	35	40	

Ground Training

Section 13: Ground training courses, etc.														
Initial Ground School	Classroom													
Self-study	As Required													
Refresher Courses	Classroom													
Operational /Technical tests	As required													
Section 14: Computer Based Trainings														
– CBT	As available													
– FTDs	As available													

1.5.7 Other training

1.5.7.1 Crew Resource Management Training (CRM) and Aeronautical Decision Making (ADM)

A CRM training programme should be required, with initial and annual training for all two pilot operations in aeroplanes and helicopters. ADM training programmes should be established for single pilot operations. The annual CRM refresher can be a block of ground instruction and form part of the annual line check.

1.5.7.2 Dangerous Goods training

Dangerous Goods Awareness training, compliant with local regulatory requirements, should be in place for all pilots to ensure that they are aware of the requirements for the carriage of hazardous materials including relevant legislation, limitations and documentation. Where dangerous goods are not carried by the aircraft operator, such training serves to highlight the hazard posed by undeclared dangerous goods that can often be carried in passengers' baggage and consigned freight.

1.5.8 Speciality training

1.5.8.1 Single pilot operations

Single pilot operations should only be used in a non-hostile environment during day VFR operations, and only after consultation with an Aviation Advisor.

Where Aircraft Operators/Member's operations have single pilot and dual crew requirements, the preferred pilot progression is Co-Pilot in the multi-crew environment before progressing to Captain in single pilot aircraft. Single pilot captains transitioning to command in multi-pilot aircraft are recommended to use the PICUS programme as found in 1.2.

1.5.8.2 Spraying operations

Aircraft operators conducting spraying operations, for example in support of offshore oil spill response, should have a written syllabus for conversion and recurrent training of aircrew engaged in spraying. The training and recency requirements should be assessed by the Member's Aviation Advisor.

1.5.8.3 Airborne geophysical survey operations

The International Airborne Geophysical Safety Association has developed a comprehensive set of guidelines for low level airborne geophysical survey operations. An extract of IAGSA's recommended practices is contained in AMG 590-S1, *Specialized operations: Airborne geophysical* [3].

1.5.9 Helicopter role-specific training

Types of role-specific operations often undertaken by operator's aircraft in support of a Member include but are not limited to: offshore, low-level geophysical survey, external load-lifting, seismic, and pipeline survey.

Due to the specialized nature of many roles required to support Members' activities, additional qualifications and experience are usually required. The additional qualification and experience requirements for a number of role-specific operations are summarized in 1.1.3.

1.5.9.1 Helicopter Underwater Escape Training (HUET)

General

HUET should be completed using an underwater escape simulator for all aircrew and frequent flying offshore passengers at intervals not to exceed four years if engaged in floatplane or offshore helicopter operations. This training should be completed in conjunction with wet dingy drills using emergency equipment similar to that installed on the aircraft.

The initial course of training should be scheduled for a minimum of one day.

HUET facilities should have the emergency exit types and sizes representative of the aircraft flown in offshore or water borne operations.

All HUET trained personnel or their companies should maintain a documented record of the training completed.

Emergency Breathing Systems (EBS)

Members should complete a risk assessment for each offshore helicopter or overwater floatplane operation to determine whether an EBS is required to provide occupants time to perform underwater egress in the event of ditching.

Compressed air EBS, life jacket with integrated re-breather and exposure suits with integrated re-breather designed to provide additional time for underwater egress should be considered.

Where EBS is designated for use, HUET should include training in the use of the EBS to ensure user proficiency.

See AMG 590-G, *Recommended aircraft and personnel equipment*, 3.3.2 [4] for additional guidance on EBS risk assessments and training.

1.5.9.2 External (sling) load operations

Where external load operations are likely to be required, they should be specified in the contract with a requirement that sufficient crews to cover the operation undergo a line check in this role before contract commencement. Pilots nominated for external load work should have a competence check formally signed off by a designated check and training captain.

Pilots should have 300 hours of external load experience, or 300 hours of long-lining, whichever is applicable.

Unless at least 10 hours practical application has been achieved in the preceding six months, competence should be re-checked during a visual Base Check, or an additional External Load Competence Check should be completed.

1.5.9.3 Seismic operations

For seismic operations, see IOGP Report 420, *Helicopter guidelines for land seismic & helirig operations* [1].

1.5.9.4 Operations to small and medium-sized vessels

Aircraft operators should have a written syllabus for training of aircrew engaged in flights to small and medium size vessels while underway. Procedures should address the following as a minimum:

a) differences in the location of the helideck (Forward/Aft/Midship) and the effect this has on helideck movement.

b) differences in Approach/Departure procedures for vessels moving at up to 5 kts and the effect this has on relative wind and turbulence at the various helideck positions.

c) use of the TD/PM circle and relative positioning to enable safe passenger movement on deck.

1.5.9.5 Helicopter offshore night operations and training

A high standard of pilot training which includes CRM, two pilots, specified night operating procedures and suitably equipped aircraft is essential for safe operations.

Where there is a requirement to carry out routine or emergency flights at night, then the operator should establish appropriate training programmes.

Only dual pilot crews should be used and both pilots should be qualified and hold a current instrument rating for the helicopter type being flown. For night operations, Captains should, in the addition to the requirements specified in Tables 1 to 4, have the following qualifications:

a) a minimum of 25 hours of night offshore time.

b) within the previous 12 months have completed initial or recurrent offshore night, IFR, CRM, deck landing proficiency training.

In order to maintain currency, pilots should undergo night and instrument training, consisting of 3 offshore approaches and departures, including takeoff and landing, every 90 days. In latitudes where night time is limited during summer months, Member companies may adjust the currency requirement on an individual contract basis for that period, provided that this remains in compliance with national legislation. A simulator of the same type or series being flown can be used to meet the three offshore approaches and departures, provided this is acceptable under the national legislation, and it has the visual fidelity to replicate landing on an offshore facility and is acceptable to the Member's Aviation Advisor.

See 1.5.5 for further guidance on simulator use.

1.5.9.6 SAR winch/hoist operations

For Secondary SAR guidance on training, see AMG 590-S5, *Specialized operations: Hoisting* [2].

1.6 Pilots general requirements

1.6.1 Medicals

All pilots should hold a valid medical certificate appropriate to their age and licence (e.g. CPL, ATPL) requirements. The frequency of medical examinations is determined by the local National Aviation Authority and/or company policy. The maximum interval between medical examinations should not exceed 12 months.

1.6.2 Payroll/salary

Aircrew should not receive remuneration solely on a basis of hours or miles flown. The method of remuneration preferred by the IOGP is fixed salary.

1.6.3 Drug and Alcohol Policy

Contractors and subcontractors should have a documented policy on the use/ abuse of alcohol, medical drugs and narcotics. Standards should be set on what the company considers to be an acceptable level of alcohol consumption, including an alcohol free period before duty. Additionally, guidance should be given to staff on which over-the-counter and prescribed medication can impair an individual's ability to perform in the cockpit or workplace.

In all cases, the air operator should comply with National legislation.

1.6.4 Use of freelance pilots

Freelance pilots may be used provided they have received proper company Induction/Conversion/ Line training before initial engagement, are included as part of the company's recurrent training programme, and have Operator/Line Proficiency Checks (OPC/LPC) (or equivalent) conversion training in accordance with national regulations. If time between engagements exceeds time between required OPCs, a training programme applicable to all company pilots, being away from flying for whatever reason, should apply to the freelancer.

Freelance pilots' competence and suitability should be formally endorsed by the senior management of the company and should meet all the Member's flying qualifications and experience level requirements. They should also be identified and accepted by the Member company prior to use.

1.6.5 Pilots flying more than one aircraft type

Aircraft operator policy regarding how many types of aircraft their pilots may fly varies significantly from company to company. The advisability of pilots flying more than one type will vary with the types involved, and the experience level and ability of the individual pilot. Nevertheless, because flying several types on a day-to-day basis inevitably increases the danger of incorrect responses in the case of emergency and the likelihood of handling errors or errors of omission, a limit should be placed on the practice.

Aircraft operators should have a written policy on the subject, which should apply across their operations. While pilots may be correctly endorsed on a number of aircraft types, it is recommended that only in exceptional circumstances would more than two types be flown on a day-to-day basis. It is preferred that only a single type is flown, or a pilot is scheduled in blocks of days on a particular type. If more than one type is flown, recency flying and type training should be closely monitored both by individual pilots and by a nominated member of the flying, training or operations staff.

2 Maintenance personnel

2.1 Qualifications and experience

2.1.1 General

Technical personnel, i.e. licensed or unlicensed engineers, should meet the minimum qualification and experience requirements presented in Table 8.

2.1.2 Qualifications

Personnel carrying out aircraft maintenance should hold appropriate licences and endorsements (see Table 8). These should permit them to carry out aircraft maintenance or act in a supervisory or management capacity of an Approved Maintenance Organization (AMO) as required by the regulatory authority of the State in which operations are being conducted and/or the State of registration of the aircraft, should it be registered in a different State.

In addition, a system of local approvals should exist whereby the operator or maintenance organization approves the individual to exercise the privileges granted by the licence and/or endorsements held on the range of equipment operated or maintained by that organization. Such approvals may be granted following formal type training and/or local on-the-job training/evaluation as appropriate.

2.1.3 Experience levels

Except in the case of supervisory/management personnel already employed in an organization introducing a new aircraft type, where additional manufacturer or other qualified support may be required during the introductory and early operational phases, the experience level requirements in Table 8 should be applied.

Table 8: Engineer qualifications and experience – required experience levels for position

	Chief Engineer Airplane [4]	Chief Engineer Helicopter [4]	Engineer Airplane [4]	Engineer Helicopter [4]
Supervisory Role	1 Year			
Total Time on Airplanes or Helicopters [3]	5 Years		2 Years	
Total Time in Field Operations	2 Years		1 Year	
Appropriate ratings (airframe, powerplant, instrument or avionics) issued by the local civil aviation authority	Yes			
Approved factory course or regulatory approved programme on aircraft type and engine for the aircraft being maintained	Yes[2]			
Formal training and field experience in helicopter and/or airplane operations, aircraft dispatching, weather forecast interpretation and radio procedures. Full knowledge of local civil aviation requirements. [1]				
Formal training and experience in radio procedures, observation techniques and duties, and obstacles/hazard identification [1]				
Formal training and field experience in helicopter external lift, winch and cargo requirements (or for Airplane operations loading systems and cargo requirements). Full knowledge of local civil aviation requirements [1]				
Formal training in Helideck Attendant or Helicopter Landing Officer duties and responsibilities compliant with OPTIO or an equivalent standard [1]				
Refresher Training conducted, including a Human Factors component and testing on knowledge of applicable manuals	Maximum interval of 3 years			

Notes:

1. Or competence checked by Company personnel.
2. In some countries, the NAA does not approve such courses. Notwithstanding, the Operator should have a written training programme for each aircraft/engine type.
3. Experience required in Airplanes or Helicopters as appropriate.
4. Engineering Qualifications/Experience: Subject to the air operator's training organization being approved under EASA Part 147, EASA Part 66 qualifications should be applied. Experience levels acquired whilst obtaining EASA Part 66 licence privileges are acceptable. Where EASA Part 66 licences have not been granted, local national equivalence is recommended.

Table 9 summarizes prior experience requirements (in addition to basic formal training course requirements) for the award of an EASA Part 66 licence. Certifying staff (i.e. those authorized to sign Certificates of Release to Service (CRS)) must, where required, have local regulator license endorsements.)

Table 9: EASA prior engineer experience requirements

Licence Category Applicant	Required years practical maintenance experience on aircraft (depending upon prior relevant training as defined and assessed by competent authority)
Category A	1 to 3 years
Category B1 and B2	2 to 5 years
Category C	3 to 5 years

Where local national licensing requirements differ from those required by EASA Part 66 (i.e. the combination of EASA Part 66 training time and additional year(s) practical application under supervision in a Part 145 organization), it is recommended that fitters, mechanics and licensed aircraft engineers:

a) Obtain the equivalent number of years experience under supervision prior to exercising full license privileges when maintaining aircraft on contract, and

b) May be employed as unlicensed trainees until such time as they have acquired the required equivalent combination of EASA Part 66 training time and additional year(s) practical application under supervision in a Part 145 organization.

Unlicensed and trainee personnel (including licensed personnel, other than those qualified under EASA Part 66), may be employed in support of the maintenance of aircraft contracted to Members provided they are subject to 100% supervision at all times. The ratio of unlicensed/trainee to qualified personnel should be agreed with the Member company.

Table 10 Illustrates EASA Part 66 licence holder and broadly equivalent acceptable qualification and experience levels for other licence holders, plus prior experience requirements for supervisory and management appointment holders.

Table 10: Engineer Qualifications EASA or equivalent

EASA Part 66 Licence Category	Privileges	EASA Part 66 requirements	Minimum experience	Equivalent non-EASA Part 66 Qualification	Typical role
Unlicensed Trainee	None	Subject to 100% supervision	Subject to air operator selection process	As per EASA Part 66	Trainee
A	CRS up to weekly inspections. Limited and simple failure rectification	CRS Base Maintenance	Subject to air operator selection process	Unlicensed Mechanic – no CRS privileges	Fitter, Mechanic
B1	CRS line maintenance. Failure rectification including avionics systems (no avionics test equipment)	2400 hours basic training in a Part 147 organization, plus 2 years practical in a Part 145 organization	Applicable Type endorsement(s)	A&P Technician, etc.	Licensed Aircraft Engineer (LAE)
B2	CRS line maintenance of avionics systems (Note: may have restricted privileges). Failure rectification of avionics systems	2400 hours basic training in a Part 147 organization, plus 2 years practical in a Part 145 organization	Applicable Type endorsement(s)	Avionics Technician, Radio etc.	Licensed Aircraft Engineer (LAE)
C	CRS Base Maintenance	3 years as B1 or B2 technician or academic degree acceptable to competent authority		NA	Licensed Base Maintenance Engineer
Continued Validity					
Continued Validity: all Part 66 licences	For as long as licence remains valid	Invalid after 5 years unless submitted to competent authority			
Independent Inspections					
Independent Inspections	B category licence subject to licence category privileges held.	In all cases, the first signatory must hold certification privileges (CRS) or equivalent for that aircraft type, as expressed in EASA Part M.	The second signatory must be able to demonstrate that they are competent and qualified to complete the independent inspection, by either; Holding CRS certification privileges for that aircraft type, OR Providing evidence of suitable training and relevant experience to certify that level of independent inspection		Independent Inspections should be carried out on any flight safety sensitive maintenance task and those defined by the operator as critical tasks or vital points
Supervisory and Management Appointment Experience Requirements					
B1/B2/C	As above for licence category held, or CRS Base Maintenance	As above	5 years exercising Cat B privileges. Must have type endorsement in the contracted aircraft type	As above	Senior LAE, Shift Supervisor, Quality Supervisor
B1/B2/C	As above	As above	7 years exercising Cat B privileges. Must have type endorsement in the contracted aircraft type, except where multiple types are operated in which case appropriate group type endorsement required (i.e. large helicopters)	As above	Base Chief Engineer, Quality Manager
B1/B2/C	As above	As above	12 years exercising Cat B (Cat B/C for Part 145 Base Maintenance) privileges including Type endorsement in the appropriate group (i.e. large helicopters)	As above	Director Maintenance, Chief Engineer; or, Director, Manager Part 145 Base Maintenance

2.1.4 Supervision of unlicensed and recently licensed maintenance personnel

Where organizations employ a mix of licensed, unlicensed or recently licensed personnel, the proportion of those having Certificate of Release to Service (CRS) privileges to others should be sufficiently high to ensure adequate supervision of work is provided at all times.

2.2 Training

2.2.1 Training records and programmes

Aircraft operators should maintain comprehensive training documentation that includes details of the training programmes provided to their personnel and the required training frequency. Individual training records should be maintained for each person.

For long term or sole use contracts, aircraft operators should provide to the Member:

a) a list of personnel that meet the Member's requirements, and

b) details of personnel changes which should be reviewed and accepted by the Member's Aviation Advisor before they commence work.

Training records should be periodically reviewed by the Member's Aviation Advisor. The aircraft operator should make these records and its training programmes available upon request.

2.2.2 Initial training

It is considered essential that all maintenance personnel receive formal training and have a minimum of two years' experience on type before issue of licences or approval for the type(s) of aircraft to be covered. It is preferred that factory level training be undergone on the type of aircraft to be used in the contract. In countries where this is not required by the aviation authority, then the aircraft operator should provide formal, general and type training for its certifying staff to meet the minimum requirements of Table 8.

2.2.3 Continuation/recurrent training

Continuation/recurrent training should be conducted at a minimum period of every three years and should include, but not be limited to:

a) changes in relevant regulatory requirements

b) organization procedures

c) standards for products being maintained

d) human factors issues identified from any internal or external analyses of incidents, and

e) Information on relevant airworthiness directives/bulletins or similar documents issued since the last training session.

2.2.4 Trainee Aircraft Maintenance Engineer/Technician/Mechanic

Where trainees are sponsored or employed directly, the requirements for unlicensed and recently licensed maintenance personnel apply equally. In addition, there should be a documented training plan that includes:

a) **Formal training** – The candidate should hold basic educational qualifications for entry into any regulator approved maintenance training course(s) relevant to the licence categories desired. Training should be provided by an approved training organization.

b) **On-the-job training**, which should be relevant and provide adequately supervised experience with documentation of the training tasks completed.

2.3 Maintenance personnel general requirements

2.3.1 Drug and Alcohol Policy

Contractors and Subcontractors should have a documented policy on the use/abuse of alcohol, medical drugs and narcotics. Standards should be set on what the company considers to be an acceptable level of alcohol consumption, including an alcohol-free period before duty.

Additionally, guidance should be given to staff on which over-the-counter and prescribed medication can impair an individual's ability to perform in the cockpit or workplace. In all cases, the air operator should comply with National legislation.

2.3.2 Avoidance of fatigue in maintenance personnel

In all cases, the air operator must comply with National legislation. Additionally, the following should be applied to all engineering staff as a minimum standard.

2.3.2.1 Total work period

Total work periods should not exceed 12 hours in any 24-hour period. Where it is essential that the working period is extended; the Head of Maintenance should approve it on a case-by-case basis.

2.3.2.2 Night shifts

Where shifts are regularly scheduled with a heavy maintenance workload to be completed through the night, the length of the duty period may be reduced from the 12-hour maximum.

Ideally, if night maintenance is necessary, the bulk of work should be completed by the shifts on duty up to midnight with the residue completed by a swing shift covering the period from approximately 2300 to 0700 hrs.

2.3.2.3 Rest

Each full working shift should be followed by a minimum 8-hour rest period. When working a 24-hour split shift on line operations, at least 6 hours rest should be provided excluding travel. There should be a minimum of 7 days off per month of which at least 4 should be in a minimum of two-day periods. When the location or climate is arduous then the rest period should be increased to minimize fatigue.

2.3.2.4 Remote camps

On locations such as seismic camps, where it is not feasible to provide other than the bare accommodation necessities, a regular 'time on site, time off site' routine should be established to ensure that maintenance personnel working under these conditions do not stay in the field for prolonged periods.

The minimum recommended ratio of time on site to time off site is considered to be 2:1 with a maximum period on site not to exceed 2 months.

2.3.3 Requirement for duplicate inspections/required Inspection Items (RII)

See 14CFR Part 135.411/419/429/431 [5] for the FAA's requirements for RII inspections.

See AMG 590-E, *Continuing airworthiness and maintenance* [6] for detailed requirements for Duplicate and RII Inspections.

Independent Duplicate/Required Inspection Item (RII) inspections should be carried out by appropriately qualified technicians, the required qualifications for whom are normally determined by the NAA, e.g. FAA Inspection Authorization (IA).

In the event that the qualification of these persons is not regulated, they should be a licensed engineer, technician or equivalent holding a type approval for maintaining the engines and/or airframe of the aircraft concerned, and be authorized by the company in accordance with its accepted process.

3 Additional support personnel training/qualifications

3.1 General

Additional support personnel as listed in 3.2 to 3.10 should meet the requirements shown in Table 11.

3.2 Helideck Landing Officers and Helideck Attendants

Personnel engaged on helideck related duties should be provided with training that includes the provisions of the OPITO Training Guide and the experience as shown in Table 11.

3.3 Refuelling personnel

Refuelling personnel should complete a formal training course at an approved training facility. It is recommended that a refresher-training course be undertaken at intervals not exceeding two years.

3.4 Air Traffic Controller

ATC controllers may be licensed or unlicensed in accordance with the requirements of the country in which operations are taking place. A controller should undertake formal training in handling and recording radio transmissions and any actions that may be required for normal and emergency operations. They should also be familiar with the Member's emergency and call-out procedures and are required to keep a log of air traffic control radio transmissions. They should comply with the requirements for a Radio Operator in 3.5.

3.5 Radio Operator

Radio operators should be VHF/HF licensed where applicable, with relevant experience of aircraft operations and procedures, and be competent in aviation R/T terminology. Radio operators should be completely familiar with the Member's emergency and call-out procedures. They should be responsible for flight watch and the log of all aircraft communications. It is highly desirable that all communications and radio logs are in the English language.

3.6 Certified Weather Observers

When certified weather observers are required for operations under IFR or night conditions, the observers should attend periodic training to maintain certification in accordance with local requirements.

3.7 Cabin Attendants

Cabin attendants should complete a formal and recorded course of training which should include coverage of the following items:

a) safety equipment

b) First Aid

c) Aircraft knowledge

d) Emergency and Survival Procedures

e) Loading Procedures

f) Documentation

g) Handling of Dangerous Goods

h) CRM, preferably with the flight crew.

Training should be carried out annually. The operator may conduct the training course but it should be formally recorded, and a syllabus should be available for reference. Where applicable, the training should match that completed by pilots.

3.8 Dispatchers/traffic clerks

Dispatchers and traffic clerks should be completely familiar with the operation of aeroplanes or helicopters. They should also have a good understanding of basic weight and balance requirements and manifest documentation.

3.9 Load Master

For operational (and sometimes commercial) reasons, it is expedient to carry 'Load Masters' (who may not be trained aircrew), for the control of passengers and freight during flight and while the aircraft is on the ground. These personnel should always be given basic training as defined in 3.7 (Cabin Attendants), with the addition of freight/cargo management. They should then be given crew status.

The operator may run the training course, but it should be formally recorded, and a syllabus should be available for reference. Formal recurrent training should be carried out annually. Where Load Masters are used to calculate and supervise the loading, they should be trained for load and balance on the aircraft type in use. However, in every case, the Captain remains responsible for checking and accepting the loading and balance calculations.

3.10 SAR Crewmen

See AMG 590-S5, *Specialized operations: Hoisting* [2].

All personnel employed as winch operators, whether full time or part time, should:

a) be an employee of, or direct contractor to the helicopter operator.

b) have completed a formal and recorded training scheme specifically for winchmen, including the following items:

   1) basic weight and balance.

   2) aircraft safety and survival equipment. Emergency procedures – to include winch problems, fouling of the cable, severing of the cable, use of bolt croppers, etc.

   3) technical details of winch operation.

   4) First Aid and cold water recovery techniques including cold shock and hypothermia.

   5) wet dinghy drill.

   6) Search & Rescue/coastguard local organization.

Crewmen should undergo wet and dry winching practical instruction which should include at least twenty lifts as the winch operator and twenty lifts as the winchman. Recurrent training should be completed every 90 days to include an aircraft safety and survival check.

Winch operator techniques may be practiced either over land or water, providing the note above is taken into account, but over water training should be carried out in order for pilots and crewmen to practice the approach and lower into position in reduced visual reference conditions.

Table 11: Additional personnel general experience requirements

	Aerial Observer	Load Master	Dispatcher	Helideck
Supervisory Role				
Total Time on Airplanes or Helicopters		1 year [3]		
Total Time in Field Operations		1 year		
Appropriate ratings (airframe, powerplant, instrument or avionics) issued by the local civil aviation authority				
Approved factory course or regulatory approved programme on aircraft type and engine for the aircraft being maintained				
Formal training and field experience in helicopter and/or airplane operations, aircraft dispatching, weather forecast interpretation and radio procedures. Full knowledge of local civil aviation requirements.			Minimum 1 year Experience [1]	
Formal training and experience in radio procedures, observation techniques and duties, and obstacles/hazard identification	Minimum 1 year Experience [1]			
Formal training and field experience in helicopter external lift, winch and cargo requirements (or for Airplane operations loading systems and cargo requirements). Full knowledge of local civil aviation requirements		Minimum 1 year Experience [1]		
Formal training in Helideck Attendant or Helicopter Landing Officer duties and responsibilities compliant with OPTIO or an equivalent standard				Minimum 1 year Experience [1]
Refresher Training conducted, including a Human Factors component and testing on knowledge of applicable manuals	Maximum interval of 3 years			

Notes:

1. Or competence checked by Company personnel.
2. In some countries, the NAA does not approve such courses. Notwithstanding, the Operator should have a written training programme for each aircraft type.
3. Experience required in Airplanes or Helicopters as appropriate.

4 Aircrew and medical attendant training for medical evacuations

4.1 Pilots

Pilots should undergo an initial and annual refresher course which is designed to increase their awareness of the differences between normal and medevac flights.

A typical syllabus would contain the following subjects:

a) Crew Resource Management (CRM) or Aeronautical Decision Making (ADM) if single pilot, including a review of crew resistance to outside/internally generated pressure to complete the task

   This training will benefit from the inclusion of any medical attendant staff.

b) aircraft preparation for medevac

c) medical crew briefing

d) patient loading and unloading

e) patient evacuation in the event of ditching or forced landing

f) potential flight profile and conditions impacting on patients (e.g. altitude and turbulence)

g) Helicopter Underwater Escape Training (HUET) when flights over water could be necessary

h) Night vision goggles if used.

4.2 Medical attendants

The medical personnel who are assigned to conduct medevacs should be kept to a small dedicated number who are thoroughly trained. They should undergo initial and annual refresher training along the lines of that undertaken by airline cabin crew (e.g. Safety and Emergency Procedures Training (SEPT). For offshore operations, they must have HUET training.

A typical syllabus would contain the following subjects:

a) General knowledge:

1) the aircraft to be used; their capacity, performance, range, capabilities etc.

2) CRM training, including responsibilities of the pilots and medical staff, authority of the pilot, responsibility to notify pilots of potentially hazardous situations or conditions, etc. See section 12 (Helicopters used for Medical Evacuations) of AMG 590-B, *Safety Management System, Quality and Emergency Response* [7]

3) altitude/turbulence impact on patients

4) dress

b) Safety and definitive knowledge:

1) danger areas

2) standard helicopter and aeroplane safety rules

3) location and operation of safety equipment, fire extinguishers, emergency exits, ELT, etc.

4) location and operation of oxygen emergency shut-off valves

5) correct stowage of medical equipment

6) patient loading and unloading procedures

7) hot loading/unloading policy and procedures. See AMG 590-B, *Safety Management System, Quality and Emergency Response* [7]

8) aircraft emergency procedures as pertaining to medevac flights, securing oxygen, securing loose equipment, seat-belts, forced landing drills, patient evacuation, etc.

9) communications, normal and emergency

10) survival instruction, including (as applicable) life-jackets, life rafts, the contents of survival packs, operation of flares and aircraft radios

11) a clear understanding of the day and night flying limitations

12) HUET, if offshore

13) winching/winchman training/responsibilities, if required. See AMG 590-S5, *Specialized operations: Hoisting* [2].

5 Passenger training

For passenger training requirements with respect to HUET, see AMG 590-D, *Aircraft operations*, 2.7 (Passenger training) [8].

References

Only the latest version of a reference should be used.

[1] IOGP. Report 420, *Helicopter guidelines for land seismic & helirig operations*.

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S5, *Specialized operations: Hoisting*.

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S1, *Specialized operations: Airborne geophysical*.

[4] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personnel equipment.*

[5] 14CFR Part 135.411/419/429/431.

[6] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-E, *Continuing airworthiness and maintenance.*

[7] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response*.

[8] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations*.

590-D
Aircraft operations

Purpose

The purpose of this module is to provide guidance to IOGP Members for the general operation of aircraft, as well as some specialized operations.

Scope

This module of the Aircraft Management Guidelines (AMG) provides guidance for general aircraft operations, including fuel planning, aircraft performance, offshore operations, flight and duty times, adverse weather guidance and ground operations.

This module applies to aviation providers and Member companies.

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1 Planning

1.1 Certification recommendations (aeroplanes and helicopters)

Aircraft that are certified to Federal Aviation Regulation US 14CFR Part 25/29 (Aeroplanes/Helicopters respectively) or EASA CS-25/29 (or equivalent) should be used. Aircraft not certified under these regulations which have documented and demonstrated engine-out performance meeting the same requirements should also be used.

Aircraft certified to Part 25/29 have higher performance criteria than those certified to US 14CFR/EASA CS Part 23/27 or equivalent (Aeroplanes/Helicopters respectively).

In addition, helicopters should be certified to Category A (or equivalent) for engine out performance.

It should be understood that certification standards other than those in Part 25/29 (or equivalent) for multi-engine aircraft may vary significantly relative to demonstrated and documented performance criteria.

1.2 Single-engine airplanes

If single-engine operations are considered, the following should be met:

a) When permitted by local regulatory authorities.

b) The environment is determined to be non-hostile. See 1.7.2.3 (Non-hostile environment).

c) Flights are conducted over reasonably short distances and favourable terrain.

d) Operations are in day visual conditions (VMC), and the aircraft is landed 30 minutes prior to official sunset.

e) Acceptable Search & Rescue Services are available. See section 8 (Emergency Response Planning) of AMG 590-B, *Safety Management System, Quality and Emergency Response* [1], and AMG 590-S5, *Specialized operations: Hoisting* [2].

f) Continuous Flight Following is maintained.

In addition to the above criteria, preference should be given to turbine powered single-engine aircraft and the aircraft should conform to all the minimum equipment recommendations listed in AMG 590-G, *Recommended aircraft and personal equipment* [3].

1.3 Helicopter performance classes

Helicopters are operated in accordance with a comprehensive and detailed code of performance in compliance with ICAO Annex 6, Part III, *Operation of Aircraft* [4], Part III, Section II, Chapter 3 (Helicopter Performance Operating Limitations).

Since Performance Classes are often misunderstood or misquoted, a description based on Annex 6 is provided in Table 1.

Table 1: Helicopter Performance Classes

		General Instructions
Class 1	If an engine fails, the helicopter is able to land within the rejected take off area or to safely continue flight to an appropriate landing area.	Helicopters must be certificated in Category A.
Class 2	If an engine fails, the helicopter is able to safely continue the flight, except when the failure occurs early during take off or late in landing, in which case a forced landing may be required.	Helicopters must be certificated in Category A. Operations must not be conducted from/to elevated heliports or helidecks at night or in a hostile environment unless it can be demonstrated that the probability of power unit failure during the exposure time at take off and landing is no greater than 5×10^{-8} per take off or landing.
Class 3	If an engine fails, a forced landing is required for single-engine and may be required for multi-engine helicopters.	Helicopters must be certificated in Category A or B. Operations are allowed only in a non-hostile environment, except that flights over-water in a hostile environment for up to 10 min per flight are permitted. Operations are not allowed at night or when the ceiling is less than 600 ft above the local surface, or the visibility is less than 800 metres. Operations must not be conducted from/to elevated heliports in a non-hostile environment unless it can be demonstrated that the probability of power unit failure during take off and landing is no greater than 5×10^{-8} per take off or landing.

1.4 One engine inoperative performance

1.4.1 Capable of meeting performance requirements

Multi-engine turbine aeroplanes capable of maintaining an engine out climb gradient sufficient to clear all obstacles until reaching a safe altitude, and multi-engine turbine helicopters capable of meeting Performance Class 1 or 2 (see Table 1) with one engine inoperative (OEI) should be used when any of the following conditions exist:

a) when operating in a hostile environment. See 1.7.2.2 (Hostile environment)

b) any portion of the flight will be in instrument/non-visual (IMC) conditions

c) when operating on an extended over water flight

d) any portion of the flight is planned for, or performed, at night.

1.4.2 Not capable of meeting performance requirements

Multi-engine turbine or piston powered aeroplanes and turbine helicopters not capable of meeting the requirements of 1.4.1 should only be used when the following conditions are met:

a) when permitted by the NAA

b) the environment is determined to be non-hostile. See 1.7.2.3 (Non-hostile environment)

c) flights are conducted over reasonably short distances and favourable terrain

d) operations are in day visual conditions (VMC), and the aircraft is landed 30 minutes prior to official sunset

e) acceptable Search & Rescue Services are available. See AMG 590-S5, *Specialized operations: Hoisting* [2] and AMG 590-B, *Safety Management System, Quality and Emergency Response* [1].

f) continuous Flight Following is maintained.

1.5 Composition of flight crew

1.5.1 Two pilot operations

Members should require that their aircraft are flown by two pilots under the conditions shown below. Further, two pilots may be mandated by the NAA in any circumstance.

Two pilot operations will always be required for:

a) IFR or night operations

b) operations into an offshore 'hostile' environment as defined in 1.7.2.2

c) where the maximum approved passenger seating configuration is more than nine

d) all aircraft greater than 5700 kg

e) multi-engine aircraft less than 5700 kg, with the exception that one pilot may be utilized for 'non-hostile' daytime operations provided the aircraft is certified for single pilot operations and performance/requirements dictate.

1.5.2 Single pilot operations

Where aircraft are certified for a single pilot and, in the view of the Member's Aviation Advisor, operations can be safely conducted by a single pilot under the proposed conditions, then the use of a single pilot may be considered.

Among the factors affecting the decision are:

a) workload

b) flight conditions – weather

c) topography

d) whether flights are conducted by day or night (single pilot not recommended for night operations)

e) whether flights are intended to take place under Instrument Flight Rules (IFR) or there is a possibility of having to enter Instrument Meteorological Conditions (IMC). (Single pilot operations not recommended)

f) traffic density

g) length and nature of intended flights

h) whether flights involve departure or arrival at major Control Zones

i) whether traffic flow is managed and STARS/SIDS apply.

1.6 Flight and duty times

1.6.1 Limits

Limits are normally imposed upon the amount of flying time, total hours of duty, and mandatory rest requirements by the NAA. Unless the NAA figures are more stringent, the limits for flight and duty time listed in this guide should apply for both helicopters and aeroplanes.

Exceptions to these guidelines may be applied after consultation with the Member's Aviation Advisor in relation to operations in remote field locations or where crews rotate on a scheduled basis.

1.6.2 Fatigue-related work

Operation specific (geophysical) crew flight and duty time limitations are listed in section 8 of AMG 590-S1, *Specialized operations: Airborne geophysical* [5] (This module provides recommended F&D times for geophysical work.) Otherwise, the guidance in this section should be followed and appropriately modified to avoid fatigue.

Fatigue related work could be: highly repetitive flight operations such as, external lift, inter-rig, or platform work requiring many landings/take offs per hour for helicopters, or a large number of sectors flown per day by aeroplanes or some single pilot operations. In particular, high ambient temperatures can induce fatigue.

When operations that are likely to cause fatigue are being flown, it may be necessary to vary crew schedules to more conservative levels.

1.6.3 Maximum flight times

Pilots should not fly in excess of the maxima listed below or those listed in mission specific portions of this guide, including time that might be flown in support of other companies or customers.

1.6.3.1 Single pilot

- 8 hours flight time per day (constitutes a flight period)
- 45 hours in any 7 consecutive day period
- 100 hours in any 28 consecutive day period
- 1,000 hours in any 365 consecutive day period.

1.6.3.2 Dual pilot

- 10 hours flight time per day (constitutes a flight period)
- 60 hours in any 7 consecutive day period
- 120 hours in any 28 consecutive day period
- 1,200 hours in any 365 consecutive day period.

1.6.4 Maximum Flight Duty Period (FDP) and Minimum Rest Times

See EASA Ops, Annex III, Part ORO - FTL Regulations [6] for further material for developing a FDP for the Member's aviation policy.

1.6.4.1 FDP

A duty period should be limited to a maximum of 14 hours per day which includes: administrative/office time, flight planning, flight preparation, flight time, post flight, completion of any associated maintenance or paperwork and any 'non-local' travel time.

The operator should define in the operations manual when the duty day starts and ends and how the flight duty period is calculated.

1.6.4.2 Rest

The number of hours of consecutive rest should be at least as long as the preceding FDP or 10 hours, whichever is the greater. Note that this might not be sufficient after workload, roster schedules and duty start times are taken into consideration.

Appropriate rest periods should be established for all operations with guidance from the NAA and/or the Member's Aviation Advisor.

1.6.4.3 Rest for rotating crews

Crews on rotating assignments that arrive following prolonged travel flights should not, on arrival at their base of operations, be scheduled for duty on Member's flights until the requirements detailed in this section have been met. Aviation Advisors should be consulted to review these requirements.

1.6.4.4 Night standby duty

Night standby duty may require additional pilots to be made available. The principles to be observed are as follows.

a) The maximum FDP/Flying Hours specified by the NAA or the Member should be observed.

b) After a day duty period, each pilot should not normally have less than 12 hours rest prior to being rostered for night standby duty.

c) If the pilots nominated for night standby duty (at their place of rest) are not used for such, then they may be considered available for duty on the following day period. If utilized for night flights, pilots must be given a minimum of 12 hours rest after completion of their FDP.

1.7 Aviation weather guidance

1.7.1 General

This section provides guidance for planning and operational decisions in regard to weather, both adverse and routine, and the impacts of weather criteria on aircraft selection/operation. It is designed for use for both aeroplanes and helicopters, and for onshore/offshore operations.

1.7.2 Operating environment and weather

1.7.2.1 Risk factors

Factors to be considered in determining the environment include:

a) topography

b) weather and temperature

c) restrictions to visibility

d) day or night

e) flight-crew experience in the environment and operation

f) type of operation

g) availability of infrastructure such as airfields, helipads, refuelling, and navigational aids

h) communications

i) aircraft type and equipment

j) protection of occupants following an unscheduled landing

k) search and rescue resources.

1.7.2.2 Hostile environment

A twin-engine aircraft certified to the requirements in 1.4.1 of this module should be specified for operations in a hostile environment. See Figure 1 (Hostile/non-hostile environment aircraft considerations).

Definition

An environment in which a safe forced landing cannot be assured, or the occupants of the helicopter cannot be adequately protected from the elements, or search and rescue response/ capability cannot be provided consistent with the anticipated exposure.

Aircraft requirements

Subject to all other considerations regarding single-engine aircraft, those that have been satisfactorily reviewed may be used in a non-hostile environment. The Member's Aviation Advisor should be consulted. See Figure 1.

1.7.2.3 Non-hostile environment

Definition

An environment can be considered non-hostile subject to the criteria shown in Figure 1, and satisfactory review and/or mitigation of each of the following:

a) an environment in which a successful emergency landing can be reasonably assured

b) the occupants can be protected from the elements

c) Search & Rescue response/capability is provided consistent with anticipated exposure.

Aircraft requirements

Subject to all other considerations regarding single-engine aircraft, those that have been satisfactorily reviewed may be used in a non-hostile environment. The Member's Aviation Advisor should be consulted. See Figure 1.

1.7.2.4 Hostile versus non-hostile environment

In determining the type of aircraft and the operational parameters to be specified for a specific project, the user should first determine the type of operating environment (hostile or non-hostile), including weather considerations, as noted in Figure 1.

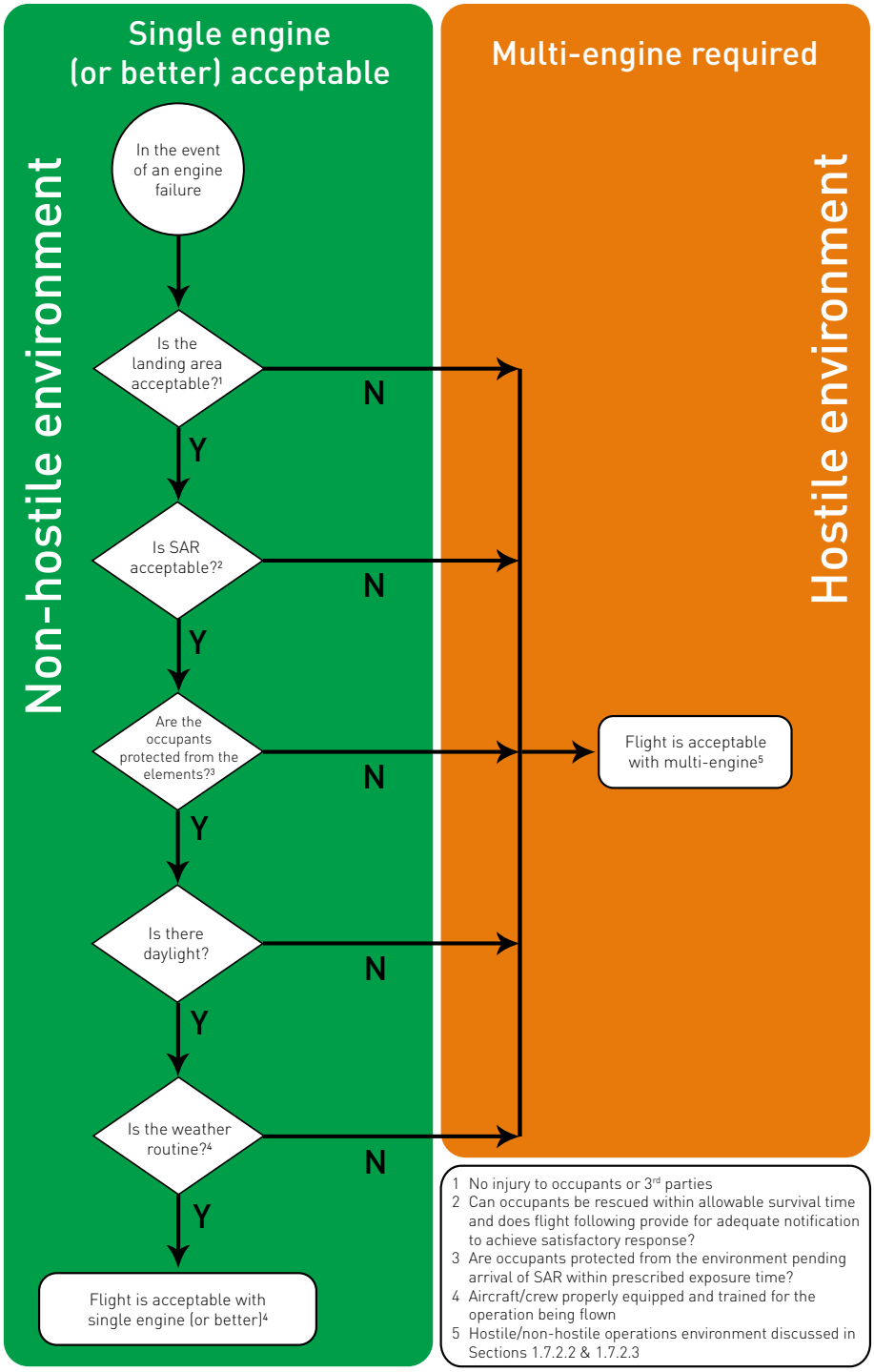

Figure 1: Hostile/Non-Hostile Environment Aircraft Considerations

1.7.3 Flight rules and weather

1.7.3.1 Instrument Flight Rules (IFR)

IFR operations should comply with local regulatory IFR weather minima unless more stringent Member requirements are issued.

1.7.3.2 Visual Flight Rules (VFR)

VFR weather minima for all types of aircraft are stipulated by the NAA and vary with respect to the type of airspace and whether it is day or night. The national regulatory minima should be followed when their figures are more conservative than those contained in Table 2 or in mission-specific weather minima presented in other sections of the AMG.

Table 2: VFR weather minima

Flight regime	Minimum operating height [a]	Cloud base (feet)	Visibility (NM) [b]	Requirements to fly given these VFR weather minima [c]
Offshore Helicopters – Day	500 [b,d]	600	3 [b,d]	
	400	500	1/2	Offshore helicopter inter field use only if visual contact is maintained with other facilities.
Overland Helicopters – Day	500 [d]	600	3 [d]	
Aeroplanes – Day	Follow NAA regulations			
All Night Ops [d]	Night Flights should be flown using only IFR procedures and minima where available, otherwise the VFR minima should be a cloud base of 1000 feet with 100 feet of vertical cloud clearance and 3 NM visibility.			Twin-engine IFR certified aircraft with dual IFR/ night current crew. All night flights should utilise IFR cockpit procedures for takeoffs and landings.

Notes:

a The minimum operating height refers to the height Above Ground Level (AGL) for overland flights, and the height Above Mean Sea Level (AMSL) for offshore flights.

b When lower minima are used, it is recommended that only twin-engine IFR certified aircraft with a dual pilot IFR current crew be used.

c VFR Flights may not depart or continue if the weather conditions at departure, en-route or the destination are below the above stated minimum.

d Minimum operating height for Day VFR with a ceiling less than 600 feet (but maintaining 100 feet of cloud clearance) and visibility to 2 NM may be allowed if the procedures are authorized by the NAA.

1.7.4 Weather reports

The provision of accurate aviation weather reports for both current and forecast conditions should be a priority for all flight operations.

Use of personnel trained and certified as aviation weather observers (see section 3.6 (Certified Weather Observers) of AMG 570-C [7]), or an Automated Weather Observation System (AWOS) which also provides weather conditions are recommended for long-term projects, where appropriate.

When provided, weather reporting equipment should be capable of determining the following information:

a) wind speed and direction

b) barometric pressure

c) temperature

d) visibility

e) cloud base

f) for helideck operations, sea state

g) for floating facilities, helideck pitch, roll and heave data.

1.7.5 Floating helidecks

Table 3: Pitch, roll and heave limits

Conditions	Limits for landing – Day	Limits for landing – Night
Pitch and roll	±3°	±2°
Average heave rate	1.3 m/sec	0.5 m/sec

1.7.6 Measurement of pitch, roll and heave (PRH)

A method of measuring PRH should be available and a means provided to transmit that data to flight crews prior to landing. See HCA document *Standard Helideck Monitoring Systems* [8] and UK CAP 437, *Standards for Helicopter Offshore Landing Areas* [9].

The accelerometers for such measurements should be located as close as possible to the helideck level and centreline to provide accurate readings. The accelerometer readings may be processed by sophisticated software that can produce accurate helideck level measurements of PRH regardless of the accelerometer location. Provided the system is operational, and these calculations can provide accurate output of the helideck PRH movements, they may be used for pilot information.

If the PRH measurement system is capable of recording accurate helideck movements for at least 20 minutes and can calculate the average heave rate, then less restrictive limits than those indicated in the chart above may be applied to specific floating facilities. Such variances should be allowed in the operator's operations manual, and be documented in the specific helideck operating procedures/ diagrams and facility helideck procedures.

The Member's Aviation Advisor should be consulted for guidance before the variances are implemented.

When a vessel gives clearance for a helicopter to land on deck, the intention is for that vessel to maintain the existing heading while the helicopter remains on the deck. The monitoring station providing deck motion limits and wind data should be manned during the entire time the helicopter is operating on the deck.

The helicopter crew should be notified immediately by radio if any of the following occurs:

a) the vessel goes off heading by 10 degrees or more

b) there is a vessel/installation or station keeping/handling problem

c) pitch/roll/heave exceeds the limits in Table 3

d) a significant change in the relative wind of 30 degrees or more, or

e) there is any other abnormal event.

Deck limitations are not applicable for take off from the helideck.

1.8 Fuel planning

Operators should publish their fuel planning requirements in their operations manuals. The requirements should be based on ICAO Annex 6 [4], Chapter 4, 4.3.6 (Fuel and Oil Supply), which provides detailed requirements of the fuel to be carried under different circumstances. If national requirements are more restrictive than those in [4] then they should apply.

1.9 Use of offshore alternates

See section 8 (Helicopters and helidecks) of AMG 590-F, *Airfields, heliports, helidecks and facilities* [10].

The reliance on offshore installations as alternates should be avoided wherever possible. It should only be acceptable in circumstances when the onshore alternative is equally unacceptable. Advice should be sought from the Member's Aviation Advisor, especially for long term requirements.

As a minimum, the following conditions should be met.

a) An offshore alternate should be used only after a Point of No Return (PNR), which should be no more than 30 minutes from the destination. Prior to PNR, onshore alternates should be used.

b) One engine inoperative landing capability should be attainable at the alternate.

c) Deck availability should be guaranteed. The dimensions, configuration and obstacle clearance of individual helidecks or other sites should be assessed in order to establish operational suitability for use as an alternate by each helicopter type proposed to be used.

d) Weather minima should be established taking accuracy and reliability of meteorological information into account.

e) The helicopter Minimum Equipment List should reflect essential requirements for this type of operation.

f) The operator has published a procedure in the operations manual for the use of offshore alternates, and that procedure has been approved or accepted by the NAA.

g) Any spare payload capacity should be used to carry additional fuel if it would facilitate the use of an onshore alternate.

The landing environment of a helideck that is proposed for use as an offshore alternate should be inspected prior to approval, taking into account the physical characteristics (size, obstacle clearance appropriate to the performance requirements of the type of helicopter concerned), orientation and the effect of wind strength and resulting turbulence from various directions. This information, which should be available to the aircraft captain at the planning stage and in flight, should be published in an appropriate form. See 8.6 (Helideck local procedures manual) of AMG 590-F, *Airfields, heliports, helidecks and facilities* [10].

The use of an offshore alternate should be restricted to helicopters that can achieve one engine inoperative (OEI) in ground effect (IGE) hover at an appropriate power rating at the offshore alternate. Where the surface of the offshore alternate helideck, or prevailing conditions (especially wind velocity), precludes an OEI IGE hover, OEI out of ground effect (OGE) hover performance at an appropriate power rating should be used to compute the landing weight.

The landing weight should be calculated from graphs provided in the relevant part of the aircraft flight manual. When arriving at this landing weight, due account should be taken of helicopter configuration, environmental conditions and the operation of systems that have an adverse effect on performance. The planned

landing weight of the helicopter, including 30 minutes of final reserve fuel, should not exceed the OEI landing mass.

When the use of an offshore alternate is planned, an operator should not select a helideck as a destination or offshore alternate unless:

a) The weather forecast indicates that, during a period commencing one hour after the expected arrival at the destination and offshore alternate the weather conditions will be at or above the following planning minima:
   - Cloud base: 600 ft (180 m) day, 1000 ft (300 m) night
   - Visibility: 3 NM (5 km)

b) Where fog is forecast, or has been observed within the last two hours within 60 NM of the destination or alternate, offshore alternates should not be used.

c) Before passing the PNR, the following actions should have been completed:
   1) confirmation that navigation to the destination and offshore alternate is assured
   2) radio contact with the destination and offshore alternate (or master station) has been established
   3) the landing forecast at the destination and offshore alternate has been obtained and confirmed to be above the required minima
   4) the requirements for an OEI landing have been checked to ensure that they can be met
   5) to the extent possible, having regard to information on current and forecast use of the offshore alternate and on conditions prevailing, the availability of the offshore alternate should be guaranteed by the rig operator in the case of fixed installations and the owner in the case of mobiles until landing at the destination, or the offshore alternate, has been achieved (or until offshore shuttling has been completed).

2 Ground operations

2.1 General

2.1.1 Smoking, including electronic cigarettes

Smoking should be prohibited at all times in aircraft, or on the aircraft movement area.

2.1.2 Alcohol and drugs

Personnel under the influence of alcohol or drugs should not be allowed to board any aircraft unless under medical supervision. The operator's check-in staff should be trained to recognise the signs of substance abuse and alert their management for appropriate action to remove the passenger from the flight manifest.

2.1.3 Operation of portable electronic devices

Consistent with local regulations for the types and sizes of electronic devices allowed to be hand carried and permitted to be used in an aircraft cabin, clear requirements should be set by the operator.

At a minimum, the requirements should address when the use of mobile phones, tablets and small (laptop/notebook) type portable computers by passengers in business aircraft is permitted, then their use should be subject to the following provisions:

a) the equipment should be switched off during take off and landing.

b) any wireless transmitting devices installed on the computer (e.g. Wi-Fi, GPRS) should be switched off before take off and remain off for the duration of the flight.

c) when not in use, the equipment should be securely stowed.

Due to the confined space in helicopter cabins, laptop/notebook computers should not be used.

Passenger operated devices that transmit or radiate radio frequency signals such as Citizen Band radios, cellular/mobile telephones, wireless network cards in laptop computers (Wi-Fi, GPRS), and wireless email devices (smart phones) should not be used.

At the discretion of the aircraft operator, use of these devices may be permitted in flight if they have a 'flight mode' which is engaged, or the wireless device can be turned off before flight and remain off for the duration of the flight.

2.1.4 Weight and balance

Prior to take off, the PIC should verify that fuel and oil requirements are correct, and weight and centre of gravity limits of the aircraft have been calculated and are within the limits for flight.

2.1.5 Seat belts and harnesses

Seat belts should be worn at all times, and shoulder harnesses, when fitted, should be worn during all landings and take offs for aeroplanes and at all times for helicopters.

2.1.6 Seating

a) Passengers should remain seated until the crew/ground crew open the doors and the pilot, Helideck Landing Officer (HLO) or Helideck Assistant (HDA), or other designated personnel tells them to disembark.

b) Passengers who have completed helicopter underwater escape training (HUET) should sit adjacent to exits and, if possible, assist non-HUET trained passengers in the event of a ditching. This applies to helicopter passengers only.

c) Passengers who have not completed HUET should be identified to the crew and other passengers in order to be provided assistance if possible in the event of a ditching. This applies to helicopter passengers only.

2.1.7 Approaching and departing to/from aircraft

The Operator or installation manager should establish procedures for the safe loading and unloading of passengers, baggage and freight.

The following are the minimum requirements:

a) Passengers should always approach and leave the aircraft in the direction instructed by the pilot, HLO or HDA, or other designated personnel, i.e. normally from the side, within view of the pilot or crewmember.

b) Passengers should not approach or leave an aeroplane from a door adjacent to a propeller that is not completely stationary, nor a jet engine that is running.

c) Passengers should not approach a helicopter from the rear or proceed any further aft of the baggage compartment door than is necessary for the retrieval of baggage or freight.

d) Passengers should not depart or approach a helicopter on the up-slope (high) side when departing on slope landings.

e) Passengers should not depart or approach a helicopter during start-up or shut down.

f) Hats, glasses and caps should be hand carried by passengers in the vicinity of helicopters to prevent them from being blown away by the main rotor wash. Eyeglasses may be worn if properly secured.

g) Long objects over one metre hand carried in the vicinity of a helicopter should be carried flat to avoid contacting the main rotor blades.

h) Passengers should be provided hearing protection and be instructed in its use.

i) The operator should set and communicate clear requirements regarding the types, and sizes of non-electronic devices allowed to be hand carried and used in an aircraft cabin.

2.2 Cargo

2.2.1 Weighing and documentation

Operators should verify that the contents of each piece of cargo offered for transport by air match the description on the manifest. All cargo should be weighed separately and manifested.

2.2.2 Cabin area cargo

Cargo carried inside the passenger compartment should be adequately secured using cargo nets, seat belts, and/or tie-down straps and should not obstruct normal or emergency exits.

2.2.3 Hazardous materials (Dangerous Goods)

IATA Dangerous Goods Regulations (Provides requirements for identification, packing, permitted quantities and recognition of DG)

2.2.3.1 Passenger flights

2.2.3.2 Minimum requirements

Operators and Member companies should provide appropriate staff including pilots with guidance and training regarding all aspects of transporting dangerous goods. These instructions should not be contrary to the pertinent regulatory documents.

Where regulatory guidance is lacking, the book *Dangerous Goods Regulations* (DGR) [11], published by the International Air Transport Association (IATA) should be applied. It provides requirements for identification, packing, permitted quantities and recognition of DG.

The IATA DGR provides detailed information on what hazardous materials can be carried on passenger or cargo-only flights including maximum quantities and packaging requirements. Operators should have approved procedures and personnel trained to IATA (or equivalent) standards in the event dangerous goods are to be transported.

It is an ICAO requirement that pilots and all personnel involved in the transport of cargo or baggage are trained in dangerous goods even if the aircraft operator is not permitted to carry dangerous goods.

2.2.3.3 Documentation

If hazardous materials are carried, the PIC should be provided with a 'Shippers Declaration of Dangerous Goods' form and comply with the operator's operations manual.

2.3 Manifests

2.3.1 Information to be recorded

A passenger manifest should be raised for each flight and should have the following minimum information recorded;

a) passenger name

b) passenger company affiliation

c) passenger weight. See 2.4 (Passenger weights)

d) personal baggage weight

e) aircraft registration

f) weight of cargo

g) the manifest form may also include a charge allocation and flight number if applicable.

A computer based manifesting system may be used, provided the pilot can be given the information.

2.3.2 Manifest changes/additions

If additions or deletions occur, the manifest should be revised to accurately reflect the names of the persons on board. This manifest should be left with or relayed to a responsible party prior to departure, with instructions to retain until the trip is completed.

2.3.3 Passenger verification

Pilots and/or other designated personnel should check the actual passenger names against the Member's list of personnel to be transported to verify that only authorized passengers are carried.

2.4 Passenger weights

2.4.1 Aeroplanes under 5700 kg and all helicopters

For aeroplanes with a maximum gross take off weight (MGTOW) less than 5700 kg and all helicopters regardless of MGTOW, actual body weights (including hand baggage) should be used.

If hand baggage is to be stowed in a different part of the aircraft to the passenger, then it should be weighed separately and the weight provided to the pilot in order to calculate the centre of gravity correctly.

2.4.2 Aeroplanes over 5700 kg

At the discretion of both the company and operator (if authorized to do so by the NAA), standard weights based on seasonal averages may be used when preparing a manifest for aeroplanes having a maximum gross take off weight in excess of 5700 kg.

2.4.3 Baggage

All checked baggage should be manifested at actual weight for all aircraft.

2.5 Passenger briefings

2.5.1 Briefing frequency and validity

Passengers should be properly briefed by the aircrew or a designated representative on emergency procedures and other safety matters prior to every flight. If permitted by regulation, the aircrew briefing may be abbreviated if a video briefing is provided or if on stopover flights.

Passenger briefings may be valid for 24 hours, after which a fresh briefing should be presented.

2.5.2 Language

Where the dominant language is not English, the operator should provide a briefing in the local language as well as English.

2.5.3 Minimum briefing requirements

The passenger safety briefing should include, but not be limited to, the following:

a) a general description of the aircraft and the danger areas around jet engines, turning propellers on aeroplanes and helicopter main and tail rotors

b) procedures for boarding and exiting the aircraft

c) locations where smoking is not permitted

d) location of non-smoking and fasten seat belt illuminating signs

e) seat belts and shoulder harnesses

   1) location and use of seat belts and shoulder harnesses. See 2.1.5 (Seat belts and harnesses)

   2) unless the design of seat belts prevents inversion, passengers should be briefed not to invert the seat belt buckle (clasp opening device against the body). Operators may consider marking the outside of the seat belt clasps to improve ability to check for proper fastening.

f) the location and operation of oxygen masks, if applicable

g) means of communication between the crew and the passengers

h) actions to be taken in the event of emergencies

i) location and operation of doors, emergency exits, emergency and life saving equipment such as fire extinguishers, first aid kits, life jackets, life rafts, survival gear, and emergency radio equipment (ELT and EPIRBs)

j) brace position for emergency landings for all seat configurations.

k) passengers to remain seated until the crew/ground crew open the doors and the pilot tells them to disembark. See 2.1.6 (Seating)

l) location and review of passenger briefing card. Information contained in the briefing card should focus on safety equipment and emergency procedures

m) proper stowage of any hand carried items

n) use of personal electronic devices (mobile phones, tablets, laptops, etc.). See 2.1.3 (Operation of portable electronic devices).

2.5.4 Additional helicopter briefing requirements

The following additional points should be covered with all helicopter passengers.

a) Passengers should remain seated and not disembark until instructed by designated personnel. See 2.1.6 (Seating)

b) Safe and unsafe directions of approach to/from a helicopter and how instructions will be delivered to passengers. See 2.1.7 (Approaching and departing to/from aircraft)

c) Requirements relating to objects being hand-carried, including hats, glasses and caps, and long objects. See 2.1.7

d) Use of hearing protection. See 2.1.7

e) The types of objects permitted and not permitted to be carried and used inside the passenger cabin of helicopters. See 2.1.3 (Operation of portable electronic devices) and 2.1.7.

2.5.5 Additional helicopter briefing items for offshore flights

Passengers should be briefed on the following additional items when flying offshore:

a) seating positions for passengers who have completed helicopter underwater escape training (HUET) and for passengers who are non-HUET trained. See 2.1.6 (Seating)

b) requirements for how immersion suits are to be worn. See 4.2 (Immersion suits for offshore helicopters and float planes) of AMG 590-G, *Recommended aircraft and personal equipment* [3]

c) procedures for evacuating an aircraft in the event of an emergency landing on the water, e.g. the helicopter should not be evacuated until the rotor has stopped, unless instructed otherwise by the PIC.

d) reminder to not inflate life jackets until they are outside the helicopter

e) the location of emergency equipment such as life rafts, and procedures to jettison the emergency exits and pop out windows and deploy the life rafts outside the helicopter

f) the proper use of reference points for orientation during the event of a rollover ditching

g) carriage of permitted loose articles in the aircraft that could present Foreign Object

h) 'NO STEP' areas.

2.5.6 Additional float plane briefing items

When operating over water, all floatplane occupants should be briefed on the use and wear of an approved life jacket that conforms to the requirements of 3.3 (Life jackets) of AMG 590-G, *Recommended aircraft and personal equipment* [3].

Passengers should be briefed on ditching procedures to include use of emergency exits, life jackets, immersion suits (if worn) and location and use of emergency equipment.

2.5.7 Video briefing

On long-term operations out of a fixed-base facility, a video briefing is recommended and should be shown to passengers prior to each flight. When provided, video briefings should be kept current and audio-visual equipment should be easily heard and seen by all passengers being briefed.

It is essential that the video reflects the exact configuration of the aircraft to be used, otherwise the information may be confusing to the passengers and lead to incorrect actions in an emergency.

2.5.8 Multi-language operations

In the event that some passengers do not fully understand the language used for the briefing, subtitles or alternate video should be provided. If necessary, a translator should be present throughout the briefing. See also 2.5.2 (Language).

2.5.9 Briefing cards

Safety briefing cards should be available on a one-per-seat basis, or the information should be displayed in the aircraft cabin so that all passengers have full sight of the placards.

Graphics with international symbols or multi-language briefing cards should be used to convey briefing information to all passengers.

2.6 Passenger marshalling areas

2.6.1 Onshore

Onshore passenger marshalling areas should consist of as much of the following as possible.

a) a designated area for the passenger and freight check-in process, i.e. for weighing and manifesting all outgoing passengers, baggage and freight on calibrated scales

b) a dedicated and secure waiting area should be designated for outbound passengers that separates them from incoming passengers

c) a designated area for the display of written and graphic material relative to aircraft safety and localized procedures

d) a viewing room for video safety briefings. This may be the same area as c)

e) if applicable, a changing room for the donning of immersion suits

f) a baggage collection area for incoming passengers.

A smooth and logical flow of passengers through the 'terminal' is desired to prevent blockages and confusion.

2.6.2 Offshore

At offshore facilities, a suitable waiting area should be identified to prevent passengers loitering at the helideck or in the helideck stairwell.

An area should also be provided for changing into/out of immersion suits (if worn) in order to minimise turnaround time.

2.7 Passenger training

2.7.1 Helicopter Underwater Escape Training (HUET) (also floatplanes)

HUET should be completed using an underwater escape simulator for all frequent flying offshore passengers at intervals not to exceed four years if engaged in floatplane or offshore helicopter operations. This training should be completed in conjunction with wet dinghy drills using emergency equipment similar to that installed on the aircraft.

The initial course of training should be scheduled for a minimum of one day.

The HUET aircraft simulator should be fitted with the emergency exit types and sizes representative of the aircraft flown in offshore or water borne operations.

All HUET trained personnel or their companies should maintain a record of the training completed.

2.8 Passenger dress requirements

2.8.1 Field, remote and inhospitable areas

Members should develop and issue requirements for passengers' clothing and footwear appropriate to the environment, regardless of the flight duration.

2.8.2 Hostile environment offshore helicopter or float plane flights

For offshore helicopter or floatplane flights in some areas, passengers may be required to wear immersion suits.

See also 1.7.2.2 (Hostile environment) of this module and 4.2 (Immersion suits for offshore helicopters and float planes) of AMG 590-G, *Recommended aircraft and personal equipment* [3].

2.8.3 Non-hostile environment offshore helicopter or float plane flights

To improve survivability in the event of a ditching of offshore helicopter or float plane flights over non-hostile waters, long leg pants, shirts with sleeves, and closed-toed shoes with skid resistant soles should be worn by passengers.

See also 1.7.2.3 (Non-hostile environment).

2.9 Passenger and cargo management on helidecks

2.9.1 Clear helideck policy

Helipads, heliports and offshore helidecks should be clear of all cargo and passengers that are being offloaded prior to passengers or cargo coming onto the helideck/heliport to board the helicopter.

Cargo should only be left on a helideck if formalized procedures, which include instructions and provisions for securing the cargo, are established in writing and followed. The instructions should describe how to place the cargo without infringing obstruction free areas. The Aviation Advisor should review the procedures prior to implementation.

2.9.2 High winds or adverse weather

The installation duty holder should establish an adverse weather policy which takes into account wind, weather, temperature and any deck motion. High winds are considered anything above 52 knots.

2.9.3 Passenger control

An HLO and HDAs should be used to control passenger movement on helidecks. Alternatively, one pilot may perform the HLO functions if there are two pilots on board.

For single piloted helicopters landing to a helideck with no HLO, the helicopter should be equipped with a loud hailer (external speaker) and the pilot should land in a position that allows positive eye contact with the passengers as they approach the helicopter.

When offloading or loading passengers with the rotors turning, the pilot at the controls should engage in essential cockpit duties only.

Not included in essential cockpit duties are the following: manifesting, weight and balance calculations or customer paperwork. Primary attention should be given to the aircraft controls and identification of hazards and passenger movement in the vicinity of the aircraft.

2.10 Passenger seated in the cockpit

No passenger should occupy any aircraft seat where flight controls are installed unless the passenger is thoroughly briefed regarding precautions against inadvertent movement of the flight controls and use of crew emergency exits. Specific reference should be made to all switches or controls whether they may be vulnerable to interference or not.

2.10.1 Aeroplanes

If readily accomplished, the flight controls should be removed from pilot stations when occupied by passengers.

2.10.2 Helicopters

The conditions below should be met if a passenger is to occupy the front seat of a helicopter:

a) the cyclic and collective sticks have been removed from that seat position, and

b) the pedals have either been disconnected or blocked to prevent inadvertent control input, and

c) the passenger is thoroughly briefed regarding precautions against inadvertent movement of the flight controls in the pilot's position, and

d) the passenger is thoroughly briefed on all accessible switches and controls whether they are vulnerable to interference or not.

2.11 Aircraft fuel tank sampling

a) Aircraft fuel tank sumps should be sampled into one container prior to the first flight of each day (0.5 litre minimum sample size, unless specified otherwise by the airframe manufacturer).

b) The samples should be drained into a clear jar with a screw top, each tested for water, marked with the sample source and retained until flights are completed for that day.

c) Water test capsule results should be documented but results in the form of capsules, etc. should not be retained with the samples.

2.12 Rotors running refuelling (RRRF)/Helicopter rapid refuelling

2.12.1 General

Rotors running refuelling may be authorized for both on and offshore operations. However, Members should be aware of the additional hazards associated with the practice and should conduct a risk assessment with the participation of the Aviation Advisor, giving sufficient notice for comment or practical assistance.

Risks will be minimized by using pressure (closed system) refuelling, if available.

2.12.2 Guidelines

If an operational requirement to conduct rapid refuelling exists, the following should be in place:

- **Approvals**: Member's management should approve the specific circumstances in which rapid refuelling may be conducted.
- **Procedures**: the operator's approved operations manual should include written procedures to be followed for the refuelling operation.
- **Training**: The aircrew and ground support staff should have completed the operator's training programme before rapid refuelling is considered.

In addition to any local regulatory requirements the following minimal guidelines should be used for rapid refuelling:

a) A pilot should remain at the controls at all times.

b) A minimum of three individuals are required for the refuelling operation, one for fuelling, one for pump shut-off, and one for fire watch (with appropriate extinguisher). A minimum of two individuals are required for pressure refuelling provided a dead-man switch is utilized.

c) Passengers are to disembark prior to the refuelling operation commencing.

d) However, if, for safety reasons, the PIC decides to refuel with the passengers on board the aircraft, they should be informed of this decision and the actions to take in the event of a fire.

e) A person should be stationed at the helicopter door in order to communicate with the passengers if they are to remain on board, and assist evacuation in the event of a fire. This person should have visual contact with the refuelling operation – radios should not be used.

f) All seat belts are to be unfastened, the main exit door away from the side where refuelling is occurring should be opened, and no smoking should be allowed.

g) Radios should not be used during refuelling, and all anti-collision lights, radar, radio altimeter, transponder and DME equipment should be switched OFF/Standby.

h) Prior to removing the fuel cap and inserting the fuel nozzle into the aircraft fuel tank, grounding wires running from the fuel station and from the fuel hose to the aircraft should be connected.

i) When refuelling is completed, the PIC should verify that all equipment is removed, the fuel cap has been securely replaced and the aircraft is properly configured for flight.

3 Flight operations

3.1 Operator procedures

3.1.1 General

Each Operator will establish Standard Operating Procedures (SOP) or Operations Manual procedures to be used by the aircrew in the performance of their duties to include but not limited to cockpit procedures, automation policy and crew responsibilities. Operators should be sufficiently concise in delineating such procedures so as to promote the early recognition by aircrew of deviations from standards. Flight Data Management (FDM) or Flight Operations Quality Assurance (FOQA) programs must be used to monitor trends regarding these procedures.

3.1.2 Sterile cockpit

Each Operator will establish a 'sterile cockpit' rule covering as a minimum, restriction of unnecessary conversation, unnecessary use of electronic flight bag (EFB), portable electronic devices (PEDs), paperwork during flight below key altitudes, and certain phases of flight or ground operations. Operator's Flight Operations Quality Assurance programs should include review use of and reinforcement of these rules.

3.1.3 Flight operations profiles

Operators should establish flight profile guidance in their Operations and Training Manuals / Checklists for critical phases of flight operations (inclusive of taxi, take-off, cruise, and landing). As part of this flight profile guidance, operators will develop procedures for the use of stabilized approach procedures for all flights. Detailed guidance is available from several regulatory authorities for review as necessary.

These procedures will be based on the following requirements, or equivalent, which define when an approach is considered stabilized.

a) The aircraft is on the correct flight path and the correct navigational data has been confirmed as entered into the navigation system for final approach to the desired airport, heliport, or helideck and the aircraft is stabilized for the approach.

b) Only small changes in heading/power are normally required to maintain the correct flight path, unless the environmental conditions on a particular day may require power changes larger than normal.

c) The aircraft is in the correct landing configuration.

d) The sink rate is no greater than 750 feet per minute for both helicopters and airplanes upon arrival at the altitudes prescribed in "f." below, or as recommended by the manufacturer. If an approach requires a sink rate greater than 750 feet per minute, a special briefing should be conducted.

e) All briefings and checklists have been completed, except for the final landing check.

f) All flights should be stabilized by 1000 feet above landing elevation in IMC and by 500 feet above landing elevation in VMC, unless the following flight profiles are in use:

   1) For helicopters where the transit height is less than 500 feet above landing elevation, the aircraft should be stabilized by 300 feet and 60 knots ground speed above the landing surface.

   2) For some operations, such as seismic work involving a high level of low altitude external load operations and remote landing sites where it is necessary to complete an overhead flight reconnaissance before landing the typical profile may require modification by the operator.

g) Anytime an approach becomes 'unstabilized' (out of compliance with the above guidelines) a go-around / missed approach should be executed immediately, unless the operator has established a limited number of deviation protocols that can be safely used to return to the stabilized profile.

h) Once the approach minimums (altitude, time, etc.) are achieved the correct airport, heliport, and helideck is confirmed.

3.2 Flight following

The ability to swiftly locate a crashed/ditched aircraft is vital to ensure survival of the occupants. If the aircraft position is known precisely, then the recovery time and the potentially high costs of a search will be kept to a minimum.

Flight following in its most basic form consists of regular 'operations normal' radio calls from the aircraft which will include its position. The frequency of 'ops normal' calls depends on the length of the flight, but should not be longer than 30 minutes; 15 minutes is preferred. Even a call every 15 minutes gives a potentially large search area for an aircraft travelling at least 2 miles per minute. The procedure for basic flight following using regular radio calls should always be available as a back-up even if satellite tracking is in place, in case the latter system becomes unserviceable.

In order to reduce the search area, satellite tracking is the IOGP's preferred method of flight following with the aircraft automatically transmitting at predetermined intervals. The interval between these transmissions should not be set at more than 2 minutes for flights less than 2 hours. High altitude aircraft operations that are under positive ATC may be excluded from this guidance.

For satellite tracking, the aircraft's position is shown on a monitor which should be subject to constant surveillance during the whole flight. The aircraft's precise position is recorded on the screen at the time of each transmission. Where only radio transmissions are used, the flight following radio operator should record each call and its time and position on a tracking log.

3.3 Crane, helicopter operational procedures

When helicopters are approaching, manoeuvring, taking off or running on the helideck, cranes should be shut down, and the crane operator should vacate the cab.

3.4 Radio silence – Perforating operations

3.4.1 Nature of hazard

Explosive operations may involve perforating, sidewall sampling, formation interval testing, explosive cutting and explosive backing off. To enable explosive operations to proceed safely and reduce disruption to other work, it is essential to identify and minimize all sources of potential stray currents and radio induced voltages, including radio transmissions.

3.4.2 Radio silence

Radio Silence is not limited to telecommunications, but is extended to cover all precautions taken to reduce or eliminate potential sources of stray currents and radio induced voltages.

The area in which transmissions are controlled includes all vessels and helicopters within 1640 ft (500 metres) of the installation.

Radio Silence should commence during the preparation of explosives and continue until the explosive device is more than 250 feet (75 m) below the seabed. During this period, no helicopter should be permitted to operate within the 500 metre zone. 'Receive only' radios may remain in operation during radio silence.

References

Only the current version of a reference should be used.

[1] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response.*

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S5, *Specialized operations: Hoisting.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[4] ICAO. Annex 6. *Operation of Aircraft*.

[5] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-S1, *Specialized operations: Airborne geophysical.*

[6] EASA Ops, Annex III, Part ORO. *FTL Regulations.*

[7] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[8] HCA. *Standard Helideck Monitoring Systems.*

[9] UK CAP 437, *Standards for Helicopter Offshore Landing Areas.*

[10] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-F, *Airfields, heliports, helidecks and facilities.*

[11] IATA Dangerous Goods Regulations.

Version 1

590-E
Continuing airworthiness and maintenance

Purpose

The purpose of this module is to outline the continuing airworthiness and maintenance requirements that an aircraft operator should adhere to.

Scope

This module covers the requirements of continuing airworthiness, maintenance management, Quality System (compliance monitoring) and Occurrence reporting.

It is applicable to all aircraft operators.

See the following, which are applicable throughout this module.

- ICAO. Annex 6. *Part I, International Commercial Operations – Aeroplanes, Part II, International General Aviation; Part III, International Operations – Helicopters* [1]
- ICAO. Annex 8: *Airworthiness of Aircraft* [2].

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1 Basic principles

The IOGP Aircraft Management Guidelines (AMG) related to Continuing Airworthiness and Maintenance are mainly inspired by the European Aviation Safety Agency (EASA) and the US Federal Aviation Administration (FAA) requirements, while maintaining compliance with International Civil Aviation Organization Standards and Recommended Practices (ICAO SARPs):

a) 'Continuing airworthiness' includes all the processes that ensure that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation.

b) The Aircraft Operator is responsible for the continuing airworthiness of the aircraft it operates. The Operator remains responsible for the aircraft airworthiness whether it owns the aircraft or is the lessee as stated in the aircraft registration certificate. In order to exercise this responsibility, the operator should ensure that:

   1) the aircraft is maintained in an airworthy condition

   2) the types of maintenance required, when, how and by whom maintenance is performed and to what standard, are determined and documented in a Maintenance Programme and Maintenance Management Manual (or equivalent)

   3) maintenance performed is documented in records kept in accordance with the Maintenance Programme, Maintenance Management Manual (or equivalent) and applicable regulatory requirements

   4) the airworthiness certificate remains valid.

c) In order to satisfy the above mentioned responsibilities, the operator of an aircraft may contract certain tasks associated with continuing airworthiness to a third party organization approved by the National Aviation Authority (NAA). However, irrespective of any contract that may be established, the operator remains responsible for the satisfactory completion of such tasks.

d) The operator should establish internally or contract with an Approved Maintenance Organization (AMO) to perform maintenance activities for the operator. The AMO should meet all applicable regulatory requirements, e.g. Part 145.

e) The AMO is responsible for the maintenance of products, parts and equipment that should be released to service by an appropriately rated Licensed Engineer. See AMG 590-C, *Personnel qualifications, experience and training* [3], section 2 (Maintenance personnel) for information on the required experience and qualifications of licensed engineers.

f) The Operator should not operate an aircraft unless it is maintained and released to service by an organization approved in accordance with the applicable regulations (an AMO). 'Maintenance Release to Service' means that the work specified in the work order is carried out in accordance with the applicable rules and, in respect to that work, an appropriately rated Licensed Engineer considers the aircraft/component ready for service. A Certificate of Release to Service (CRS) is then issued.

g) The operator should establish an internal organization with dedicated qualified staff to manage the aircraft's continuing airworthiness as specified in the above subsections of this module. Such continuing airworthiness organization should provide formal work orders to the internal or contracted AMO, clearly describing what maintenance is required, when it has to be performed and to what standard, typically based on manufacturers' recommendations or an approved maintenance programme.

2 Continuing airworthiness

2.1 Continuing airworthiness tasks

The Continuing Airworthiness Management Organization (CAMO) should ensure aircraft continuing airworthiness by:

a) the development and review of a maintenance programme in accordance with applicable regulations and approved by the governing airworthiness authority

b) the receipt, control, execution and completion of:

   1) all Airworthiness Directives (ADs) and Service Bulletins (SBs), issued by the governing aviation authority and the country issuing the original Type Certificate, including ADs and SBs which have an impact on flight operations

   2) Operational Directives (ODs) issued by the governing aviation authority which have a continuing airworthiness impact

   3) other measures mandated by the governing authority in response to a safety issue or an issue reported by a relevant authority such as a CAMO

c) the rectification of any defect and damage affecting safe operation, in accordance with:

   1) applicable regulations or Maintenance Data (see 2.3)

   2) Approved Minimum Equipment List (MEL), and

   3) Configuration Deviation List (CDL), as applicable to the aircraft type

d) the planning of all maintenance, in accordance with the above mentioned Aircraft Maintenance Programme

e) the control of the accomplished maintenance to ensure that it has been executed by an appropriately approved maintenance organization (AMO) to the required standard and in adherence to applicable regulations and Maintenance Data

f) the accomplishment of modifications using data approved by the governing authority

g) the evaluation of all Service Bulletins, and the accomplishment of all Service Bulletins usually classified as 'mandatory', 'alert', etc., and the establishment of an embodiment policy of Manufacturers Recommended/ Optional Bulletins

h) the proper management of all continuing airworthiness records (e.g. airframe/engine/propeller logbooks, life limited parts and log cards), including the operator technical log

i) the proper monitoring of the aircraft configuration to ensure that it reflects the current status of the aircraft in accordance with the Type Certificate

j) the development of procedures, to be included in a manual approved by the governing authority, to identify

    1) duties and responsibilities, qualification and experience of the staff employed to accomplish the above tasks; and

    2) how airworthiness related activities, including a) through i) above, will be accomplished.

2.2 Maintenance programme

The maintenance programme should comply with the following:

a) instructions issued by the governing authorities

b) instructions for continuing airworthiness issued by the holders of type certificates and supplemental type-certificates

c) instructions for continuing airworthiness issued by approved design organizations for modifications and repairs

d) additional instructions proposed by the operator and approved by the applicable authorities.

The aircraft should only be maintained according to one approved maintenance programme at any one time.

The maintenance programme should be approved by the governing aviation authority and should be reviewed at least annually, taking into account the environmental conditions and utilization, to:

e) ensure compliance with new and/or modified maintenance instructions included in the documents affecting the programme basis (e.g. from the manufacturer, Maintenance Review Boards (MRB))

f) evaluate the programme effectiveness, aiming to reduce repetitive defects, malfunctions and damage to a minimal level, and

g) ensure adherence to scheduling of inspection and maintenance tasks; the source of such scheduling may include internal or external organizations, MRBs, manufacturer instructions or directives from the governing authority.

The maintenance programme should contain the following basic information:

h) the type/model of the aircraft, engines and, where applicable, auxiliary power units and serial number of the aircraft

i) contents, list of effective pages and their revision status

j) conditions of aircraft utilization (e.g. environment, type of operations, average yearly utilization, etc.)

k) the tasks and the periods (intervals/frequencies) at which each part of the aircraft and its components, including optional installations, should be inspected, replaced and/or overhauled as recommended by the Type Certificate Holder and STC Holders, including those approved by the design authority (e.g. Mandatory Life Limitations) and those derived from modifications/repairs

l) permitted tolerance, if applicable, to interval/frequency of each maintenance task

m) details of cycle counting method applicable to components subject to mandatory life limitations

n) description of engine performance trend monitoring, when applicable

o) details of conditional/unscheduled inspections required after flights under unusual conditions, or after exceeding certain limits and values indicated by the instruments, or after operational incident (i.e. lightning strike, hard landing, etc.)

p) if applicable, details of ageing aircraft system requirements

q) details of, or cross-reference to, any required reliability programme or statistical methods of continuous surveillance.

2.3 Maintenance Data

Maintenance Data is defined as: any applicable requirement, Maintenance Programme, procedure, standard, Airworthiness Directive, Alert Service Bulletin, Service Bulletin or information issued by the NAA, Original Equipment Manufacturer, or governing authority.

The Operator should ensure that all applicable maintenance data are current and readily available for use by the continuing airworthiness staff, when required.

2.4 Aircraft Continuing Airworthiness Record System

The Operator should maintain proper maintenance and flight records required by the applicable national regulations.

Upon completion of any maintenance, the appropriate CRS should be entered in the aircraft records.

As a minimum, the aircraft records should consist of the following documents:

a) airframe logbook

b) engine logbook(s) and related components log cards

c) propeller logbook(s)

d) log cards, for any service life limited and TBO (Time-Between-Overhaul) component

e) the aircraft technical log.

The above aircraft records should contain complete and current:

f) Airworthiness Directive, Alert Service Bulletin, Service Bulletin or information issued by the NAA, Original Equipment Manufacturer, or governing authority

g) status of modifications and repairs

h) status of compliance with maintenance programme

i) status of service life limited components

j) mass and balance report

k) list of deferred defects.

The aircraft type and registration marks, the operator, the AMO, the date, together with total flight time and/or flight cycles and/or landings, as appropriate, should be entered in the aircraft technical logbook.

All the above mentioned continuing airworthiness records should be managed by means of a reliable aviation maintenance software programme, capable of managing:

l) components tracking

m) flight time tracking

n) logbook tracking

o) Airworthiness Directives/Service Bulletins

p) Work Order management

q) inventory control, recommended.

The operator should retain all maintenance records of work carried out on its aircraft to ensure that it has been executed to the required standard. The records should be stored in a manner that ensures protection from damage, alteration and theft. Unless more stringent regulations are in place, this software should have a backup system to run no more than 24 hours after any entry.

2.5 Maintenance planning

The planning of maintenance, in accordance with the approved Aircraft Maintenance Programme, should be executed by using reliable software which allows for traceability.

Formal work orders, listing each scheduled maintenance inspection/check required, should be issued and sent to the maintenance staff in good time for them to prepare.

2.6 Minimum Equipment List (MEL)

An operator should have a Minimum Equipment List (MEL) for each aircraft in the fleet, developed by the operator based on the manufacturer's Master Minimum Equipment List (MMEL), and approved by the governing authority. MELs should be readily available to flight crews and maintenance personnel for reference.

The MEL is a list which allows the operation of the aircraft, under specified conditions, if particular instruments, items of equipment or functions are inoperative at the commencement of flight.

The MEL should be based upon, but no less restrictive than, the relevant Master MEL (MMEL) developed by the manufacturer and approved by the governing authority. Clear reference should be made to the originating MMEL, including the revision status.

2.7 Continuing airworthiness workplace

The personnel involved in the management of continuing airworthiness tasks should be provided with suitable office accommodation so that they can carry out their designated duties in a manner that contributes to upholding good standards.

A dedicated space for a technical library should be included in the accommodation, and fireproof, secure lockers provided for hard copies of airworthiness records.

3 Maintenance management

The maintenance organization should ensure that no aircraft is released to service unless Licensed Engineers, as authorized by the maintenance organization, have issued the CRS when it has been verified that all maintenance, required through a work order, has been properly carried out.

Elementary work or servicing (e.g. oil changes and light bulb replacement) should be performed under the supervision of a Licensed Engineer. See 3.1.1e).

3.1 Definitions

3.1.1 Line maintenance

Line Maintenance may include:

a) troubleshooting

b) defect rectification

c) component replacement with use of external test equipment if required. Component replacement may include components such as engines and propellers

d) scheduled maintenance and/or checks including visual inspections that will detect obvious unsatisfactory conditions/discrepancies but do not require extensive in-depth inspection. It may also include internal structure, systems and power plant items which are visible through quick opening access panels/doors

e) minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means

f) aircraft configuration changes to support different roles.

3.1.2 Base Maintenance

Maintenance tasks falling outside the criteria in 3.1.1 are considered to be Base Maintenance.

3.2 Maintenance Organization Procedures

The maintenance organization should establish a set of procedures, including at a minimum:

a) the organization safety and quality policy

b) the titles and names of the post holders involved in the maintenance management, including deputies

c) the duties and responsibilities of the above mentioned post holders

d) an organization chart showing associated chains of responsibility

e) a general description of manpower resources, including a list of licensed engineers, authorized to release the aircraft to service

f) a general description of the facilities where maintenance, either line or base, is carried out

g) organization scope of work relevant to levels of maintenance for each aircraft type and components

h) the maintenance and quality system procedures required to accomplish the tasks of the maintenance organization

i) initial and recurrent training and qualification procedures for all personnel working in the maintenance organization

j) a list of subcontracted organizations, working under the responsibility of the maintenance organization, where applicable, including assignments for quality assurance of the subcontractors

k) a list of line stations, where applicable

l) a list of contracted organizations, where applicable, including assignments for quality assurance of the contractors

m) Maintenance Test Flights.

These procedures are typically contained in a dedicated manual (e.g. Company Maintenance Manual and Maintenance Organization Exposition) that should be amended as necessary to reflect the actual organization processes.

3.3 Maintenance records

The maintenance organization should establish a work card or worksheet system, which is consistent with the manufacturer's requirements, to ensure a detailed record of the accomplishment of each maintenance task (including measurement of force, weight, tightening torque, bearing play, etc.).

Work cards should also be used when lengthy troubleshooting and/or defect rectification takes place.

In order to prevent omissions, every step of the maintenance task should be signed off by appropriately qualified technicians. A 'sign off' is a statement by the competent person, properly authorized but not necessarily a Licensed Engineer, performing or supervising the job.

Identifying stamps used in place of signatures in maintenance records should be listed in the organization's Maintenance Manual/Exposition against the names of the authorized personnel.

Maintenance records should be neat, legible and complete.

The work cards or work sheets should be collected into a work package which contains maintenance records in a structured manner.

Maintenance records should refer to the revision status of the maintenance data used. Records should be stored in a safe and secure manner with regard to fire, flood and theft.

3.4 Production planning

Production planning consists of scheduling the forecast maintenance work, based on the work order issued by the continuing airworthiness organization, to ensure the availability of all necessary personnel, tools, equipment, material, maintenance data and facilities, taking into account human performance limitations.

Furthermore, when it is required to hand over the continuation or completion of maintenance tasks for reasons of a shift or personnel changeover, relevant information should be adequately exchanged between outgoing and incoming personnel.

3.5 Maintenance key items

3.5.1 Critical maintenance tasks

The Maintenance Organization should have a procedure to reduce the possibility that an error is repeated on identical components, compromising the safety of several systems.

During a maintenance task, a person should not perform work involving the installation of several critical components of the same type on more than one system of the same aircraft; in case only one person is available such person should re-inspect the installed components.

3.5.2 Independent Inspections

An Independent Inspection, also known as a Duplicate Inspection, or as a Required Inspection Items (RII), or similar, is required when any flight safety sensitive or critical maintenance task is carried out.

Flight safety sensitive or critical maintenance tasks are those tasks that, if not performed properly, could result in a failure endangering the safe operation of the aircraft. There is no universally agreed list of tasks or points against which Independent Inspections should be carried out, however they are normally associated with an aircraft control system by which the flight path, attitude, or propulsive force of the aircraft is changed.

As not all regulators require Independent Inspections, member companies should include these requirements in its contract.

The tasks listed below should require an Independent Inspection:

a) installation, rigging and adjustments of flight controls, including 'Fly by Wire' (FBW) systems

b) installation of aircraft engines, propellers and rotors, including FBW components

c) overhaul, calibration or rigging of components such as engines, propellers, transmissions and gearboxes.

The Independent Inspection should cover as a minimum:

a) correct assembly

b) correct locking

c) full, free and correct movement of controls over the full range of operation

d) manufacturer's settings

e) rigging standards.

An Independent Inspection consists of an inspection, performed by an 'independent qualified person', of a task carried out by an 'authorized person', taking into account that;

a) the 'authorized person' assumes full responsibility for satisfactory completion of the task;

b) the 'independent qualified person' attests satisfactory completion of the task and that no deficiencies have been found.

All tasks requiring Independent Inspection should be clearly identified and recorded in the aircraft maintenance records, at the point where the task was completed, with appropriate certification recorded.

The certification should state the component was inspected for, as a minimum:

a) correct assembly

b) correct locking

c) full, free and correct movement of controls over the full range of operation

d) manufacturer's settings.

The operator should maintain a list of flight safety sensitive or critical maintenance tasks and designate independent qualified persons authorized to perform Independent Inspections.

This may include, when away from the normal maintenance facilities, and only minor adjustment of a control is required, a pilot, if approved by appropriate aviation authorities.

Clear training and qualification requirements should be in place for all level of staff approved to carry out Independent Inspections.

All tasks requiring Independent Inspection should be clearly identified in the work cards, at the point where the task was completed, with appropriate certification recorded.

3.5.3 Foreign Object Damage (FOD) checks

After the completion of all maintenance, a verification check (should be carried out to ensure the aircraft or component is clear of all tools, equipment and any other extraneous parts and material, and that all access panels removed have been refitted correctly. Such a verification check should be recorded on the maintenance work card system.

3.6 Aircraft components/material management

3.6.1 Classification of components and materials

All components/materials are normally classified into the following categories:

a) components/parts included in any aeronautical type design. In serviceable condition, they should be accompanied by an Authorized Release Certificate (e.g. FAA 8130-3, EASA Form One, or equivalent)

b) unserviceable components which may be repaired/maintained by an approved maintenance organization.

c) standard parts used on an aircraft, engine, propeller or other aircraft component when specified in the manufacturer's illustrated parts catalogue and/or the maintenance data. Standard parts are those manufactured in complete compliance with an established industry, agency, governing authority or other government specification. Standard parts should be accompanied by evidence of conformity traceable to the applicable standard.

d) components that have reached their certified life limit or contain a non-repairable defect and should not be should be quarantined to prevent fitment to an aircraft.

e) materials, both raw and consumable, including paints and lubricants used in the course of maintenance when the organization is satisfied that the material meets the required specification and has appropriate traceability. All such materials should be accompanied by documentation clearly relating to the particular material lot/batch and containing a certificate of conformity.

3.6.2 Bonded, quarantine and inflammables storage areas

Storage facilities for serviceable aircraft components should be clean, well-ventilated and maintained at a constant dry temperature to minimize the effects of condensation.

Manufacturer's storage recommendations should be followed, when available.

Dedicated and clearly identified areas should also be provided to properly segregate incoming, unserviceable and serviceable material.

a) parts certified as fit to be used on or fitted to an aircraft should be labelled (tagged) 'Serviceable' and held in a bonded store awaiting allocation to an aircraft.

b) parts not yet certified or parts that have failed certification, have reached their life limited expiry date or have been damaged should be held in a quarantine store until they are disposed of in an appropriate manner (e.g. returned to supplier, recertified, repaired, scrapped).

c) inflammable materials, such as paints and lubricants (may include some chemicals) should be stored in a properly constructed fire proof store which is built and equipped to meet the local fire regulations.

3.6.3 Identification and disposal of unserviceable parts, materials, tools and equipment

The word 'Parts' in this section applies to all parts, materials, tools and equipment.

Parts that have failed an incoming inspection should be labelled (tagged) 'Unserviceable' or 'Repairable' as the case may be, and placed in the quarantine store for repair and/or return to the supplier.

Parts that have reached the end of their certified life and can be overhauled should be labelled 'Repairable' and placed in the quarantine store before being sent for overhaul.

Parts that have reached the end of their life, have been damaged and cannot be overhauled or repaired should be labelled as 'Scrap'. Scrap parts and materials should be rendered impossible to use (cut, broken, etc.) and disposed of in an appropriate manner.

Some materials, especially paints and lubricants (greases) are provided with an expiry date which should be adhered to. Such materials should be disposed of in an environmentally responsible manner which may be subject to local regulation.

3.6.4 Responsibilities of qualified personnel

Based on the preceding sections, persons trained and qualified in company and regulatory procedures (if required) personnel should:

a) carry out incoming components/material inspection to ensure that appropriate certificates are available and no damages occurred during transportation; incoming inspection results should be duly recorded

b) ensure that the particular component is eligible to be fitted on the specific aircraft configuration at the installation

c) clearly identify unserviceable components, parts and material (e.g. 'Unserviceable tag', etc.) and remove them from the serviceable storage area into a quarantine area when their serviceability has expired

d) Manage all materials/components and equipment according to minimum spares/material /equipment on stock criteria, in compliance with manufacturer's recommendations, at the base where aircraft is operated.

e) wherever practicable, keep all aircraft components/material packaged in their original protective bags to minimize damage and corrosion during storage.

f) ensure that life-limited spares are removed from the inventory when their serviceable limit has been reached.

3.6.5 Materials used in upholstery and internal trim

All materials used in refurbishment of aircraft interiors should meet burn and fireblocking requirements of the manufacturer and NAA. Certificates of burn tests of all materials used should be retained in the aircraft records.

3.7 Equipment and tools

All tools and equipment should be made available during the execution of maintenance as specified in the manufacturer's maintenance data. IOGP recommends that such tools and equipment are supplied by the organization conducting the maintenance and are not privately owned.

All (including both company and privately owned, if applicable) tools and equipment should be subject to a control process to identify the user, the item's whereabouts and the aircraft concerned; the process should include a reconciliation, daily or prior to an aircraft's release for service, whichever comes first. See also 3.5.3 (Foreign Object Damage (FOD) checks).

A process should be in place to track tools and equipment that require inspection, or service or calibration, and a system of labelling all such tools and equipment should be established to give information on when the next inspection, service or calibration is due, and/or if the item is unserviceable for any other reason. Inspection, calibration or servicing procedures for all such tools and equipment should comply with manufacturers' instructions, regulatory requirements and/or applicable industry standard.

When a remote outstation is set up, all necessary equipment and supplies should be available on site according to the authorized level of maintenance.

3.8 Maintenance organization facilities

The maintenance organization should ensure that appropriate facilities are made available for all planned work, ensuring in particular, protection from the elements.

3.8.1 Base maintenance facilities

For 'base maintenance' of aircraft, hangars should be available, large enough to accommodate aircraft on planned base maintenance, properly equipped for the required checks and ensuring a working environment such that the effectiveness of work is not impaired.

Maintenance staff should be provided with an area where they may study maintenance instructions and complete maintenance records in a proper manner.

3.8.2 Line maintenance

For line maintenance of aircraft, hangars are not essential but a hangar or other shelter should be used during inclement weather (e.g. outside air temperatures <+5°C or >+40°C, during snowfall, heavy rain, hail or sandstorm). The line maintenance working environment should be such that the particular maintenance or inspection tasks can be carried out without environmentally-caused hazards to the work process or maintenance personnel, or significant distractions.

3.8.3 Ancillary workshops

The maintenance organization should have ancillary workshops or approved providers, which support the primary activities (depending on the scope of the maintenance conducted), such as:

a) avionics workshop

b) general workshop

c) spray booth

d) sheet metal shop

e) battery shop

f) component overhaul shop

g) engine shop

h) propeller shop amongst others.

All ancillary workshops should be under control and subject to Quality Assurance audits.

3.8.4 Personnel working conditions

The maintenance organization should ensure that:

a) its personnel are equipped with clothing appropriate to working in the environmental conditions.

b) personnel are equipped with appropriate Personal Protective Equipment (PPE) and that it is used according to the organization's instructions.

c) adequate lighting is made available for maintenance conducted in low light conditions.

4 Quality (Compliance Monitoring) System

The Operator should establish an independent Quality System (compliance monitoring), or Quality Assurance System.

Full details of the requirements for a Quality Assurance System are listed in AMG 590-B, *Safety Management System, Quality Assurance and Emergency Response Management* [4] section 6.

5 Occurrence reporting system

An occurrence reporting system should be in place for both the continuing airworthiness and maintenance organizations.

An effective internal reporting system is symptomatic of a safety culture based on a proactive approach aimed at improving system resilience against errors without using blame-punitive methods (Just Culture).

The occurrence reporting system should be integral to the corresponding elements of the Safety Management System.

References

Only the latest version of a reference should be used

[1] ICAO. Annex 6 to the Convention on International Civil Aviation. Part I: *International Commercial Operations – Aeroplanes*. Part II: *International General Aviation*. Part III: *International Operations – Helicopters.*

[2] ICAO. Annex 8 to the Convention on International Civil Aviation. *Airworthiness of Aircraft.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[4] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response.*

590-F
Airfields, heliports, helidecks and facilities

Purpose

The purpose of this module of the Aircraft Management Guidelines (AMG) is to provide guidance on the design, inspection and operation (including fuel supply systems) of airfields, heliports, helidecks and facilities.

Scope

This module of the AMG covers essential aspects of airfields, heliports, helidecks and facilities, including design, meteorological equipment, Rescue and Fire Fighting (RFF) and some offshore helideck requirements.

The reference material provides more detail and is a legal requirement in most countries.

This module provides guidance on the design, management and operation of fuel systems to prevent the uplift of contaminated fuel into aircraft.

This module applies when the Member owns or operates an airfield, heliport, helideck and/or a fuel supply system.

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1 Airfields, heliports, helidecks and facilities design references

ICAO Annex 14, Volume I, *Aerodrome Design and Construction* [1] and Volume II, *Heliports* [2] should be used as the basic reference documents for design considerations in all new airfields, heliports, helidecks and facilities, and in the construction or major rework of existing ones, where no local guidance is available.

UK CAP 437 [3] is a more workable document than Annex 14, Volume II and has been adopted by several countries. It does not conflict with Annex 14, Volume II.

Additional details are listed in the helideck, heliport and airstrip sections in this module.

2 Airfields, heliports, helidecks and facilities reviews

2.1 Design reviews

A Member's Aviation Advisor should participate in all preliminary and critical design reviews for the construction or modification of the Member's airfields, heliports, helidecks and supporting facilities. This participation should include other Members as appropriate to ensure operational and safety considerations are identified and addressed.

2.2 Periodic reviews

All airfields, heliports, helidecks and supporting facilities (fuel systems, hangars, fire suppression, passenger handling areas, etc.) should have periodic (minimum of annual) safety, operational and quality assurance reviews by the appropriate regulatory authority or a qualified Aviation Advisor and by the operator.

Records of such reviews and any remedial actions taken should be maintained.

3 Variances

Any variation to references [1], [2] and [3] should be forwarded to the Member's Aviation Advisor.

4 Weather monitoring systems

4.1 Weather observation requirements for VFR operations to manned facilities

To be consistent with ICAO Annexes 3 and 14 [1][2][4], airports, airstrips, heliports and helidecks should be equipped with a weather station with the following:

a) a wind indicating system

b) a temperature gauge

c) a barometric gauge

d) a means of measuring dew point for night or IFR operations

e) a means of providing cloud ceiling height and visibility (either with a trained weather observer or automated weather system that provides this information (AWOS-III, ASOS, AWSS or equivalent)

f) a means of relaying this information to an aircraft.

Helideck weather stations should also have the following:

g) ability to report sea state which may be estimated visually or by using wave measurement equipment

h) offshore floating facilities should also have a means of measuring helideck pitch, roll and heave.

For placement of weather observation stations, the following guidance may be used where none is provided locally.

i) one weather station for each airfield, heliport, helideck or facility area encompassing an area of 10 miles in radius or less, or

j) multiple weather stations for larger areas (two automated weather system or one and one other weather station with a trained weather observer may cover field areas covering up to 60 × 80 miles).

In any case, for stations with only an automated weather system there should be a backup capability of a trained observer.

4.2 Weather observation requirements for IFR/night operations

For areas where IFR or night operations are to be conducted, the weather station should provide all the items in 4.1a) to e) and, in addition, the following.

a) The weather observer should be certified via training in an approved weather observation course.

b) Consideration should be given to providing an automated weather system with certified weather capabilities.

4.3 Weather equipment maintenance

Equipment should be calibrated annually or as per manufacturer recommendations. Equipment should be maintained in accordance with manufacturer's instructions.

5 Rescue equipment for airfields, heliports, helidecks and facilities

Rescue equipment, if required by local authority, should be provided in a crash box protecting all components from the elements.

Inspection schedules of the equipment should be formulated and periodic inspections documented.

Examples of the required equipment can be found in [1], [2], [3] and the ICAO *Airport Services Manual* [5].

6 Fire protection and equipment for airfields, heliports, helidecks and facilities

All airfields, heliports, helidecks and facilities should have a means of extinguishing a fire that is commensurate with the potential risk.

Inspection schedules of the equipment should be formulated in accordance with the manufacturer's recommendations or local regulations. Periodic inspections should be documented.

Examples of the required equipment can be found in [1], [2], [3] and [5].

In the absence of local regulatory requirements, the procedures outlined in The National Fire Protection Association NFPA 418, *Standard for Heliports* [6] should be followed.

7 Navigation aids

All installed navigation aids should have a periodic maintenance programme. This programme should include annual calibration according to the specific Manufacturer's published procedures.

All navigation aids, whether onshore or offshore, should have aeronautical navigation frequencies that have been provided by the specific country of operations NAA or authorized communications agency. Frequencies provided from other sources are not recommended for air navigation purposes.

8 Helicopters and helidecks

8.1 General

ICAO Annex 14, Volume II, *Heliports* [2] should be used in all design considerations, construction or major rework of existing heliports or offshore helidecks if no local regulatory guidance exists.

8.2 Design references

All new helidecks should be designed to accommodate the largest helicopter anticipated for use during the life of the structure. For practical implementation guidelines and practices, use [2] and [3].

Criteria for mobile offshore drilling unit (MODU) helidecks are contained in International Maritime Organization *Code for the Construction and Equipment of Mobile Offshore Drilling Units* [7].

These criteria may be applied to other mobile offshore units.

Shipboard helidecks such as tankers and seismic vessels should conform to International Chamber of Shipping *Guide to Helicopter/Ship Operations* [8].

8.3 Size

As a minimum, any heliport or helideck should be sufficient in size to accommodate the largest helicopter using the landing area for single helicopter operations.

The 'D' value, where 'D' is the largest overall dimension of the helicopter with the rotors turning (measured from the most forward position of the tip path plane of the main rotor to the most rearward position of the tip path plane of the tail rotor), will define the maximum size of helicopter able to use the helideck.

New build helidecks should conform to the minimum size recommended in ICAO Annex 14 [2], unless the local guidance provides for variances.

Helidecks mounted on the bow of Floating Production Storage and Offloading vessels (FPSOs) may require larger than normal diameters, up to 1.5D, due to pitch, roll, and heave considerations. Advice from the Member's Aviation Advisor should be sought before completing design on FPSO helidecks.

8.4 Second helicopter operations to obstructed helidecks

Local helideck procedures and/or the operator's Flight Operations Manual (FOM) should include procedures to be followed when landing a second helicopter on a helideck that is normally only approved for one helicopter (first helicopter has a maintenance fault, etc.).

A formal risk assessment should be conducted with contributions from all affected parties: the helicopter operator and the aircraft Captain, the offshore manager and HLO and others as required.

Key considerations for the risk assessment include the following:

a) Whether alternate means, vessel, etc. can fulfil requirements for rescue of the first helicopter.

b) Operations should be daylight only and should be allowed by the FOM.

c) Use of a smaller helicopter if possible to fulfil requirements.

d) Minimum obstruction clearance during landing or take-off should not be less than the greater of a third rotor diameter or 4 metres. Any such obstructions should be located within the area swept by the 8 o'clock forward through to the 4 o'clock position of the landing helicopter as viewed from the flight deck.

e) Whether the helideck is structurally capable of supporting the total weight that will be applied to the helideck, including any other obstructions.

The risk assessment should determine any mitigating measures that will reduce the overall risk to ALARP. If this cannot be achieved and agreed by all the contributors, then the landing of a second helicopter should not take place.

A plan on the means to conduct the operation should be documented and all parties briefed on the procedures to be adopted.

In any event, the helicopter Captain should have the final decision on whether or not to land on the obstructed deck.

8.5 Operational hazard considerations

A number of hazards can exist at offshore facilities and the local helideck procedures manual or the FOM should have written operational procedures for closing helidecks and have hazard warning systems for the hazards noted below. The Member's Aviation Advisors may provide sample procedures if desired.

a) crane – helicopter operational procedures

b) helicopter/tanker operation

c) helideck/heliport operational hazard warning(s)/procedure(s)

d) perforating operations

e) gas venting

f) hydrogen sulphide gas (if applicable for the area).

8.6 Helideck local procedures manual

Members' operations with helidecks should have, for pilot use, a Local Procedures Manual detailing operational procedures, hazards, etc. for each helideck.

These Manuals should include as a minimum the following:

a) overhead and side views of the helideck

b) size/weight capability

c) markings

d) lighting (if installed)

e) communications

f) weather capabilities

g) obstacles

h) turbulence issues

i) hazards

j) any specific operational procedures.

These often take the form of 'approach' plates and, lacking other references, [8] can be used.

8.7 HLO and HDA standards

For HLO and HDA training, see section 3 of AMG 590-C, *Personnel qualifications, experience and training* [9].

9 Heliports design reference

ICAO Annex 14, Volume II, *Heliports* [2] should be used in all design considerations, construction or major rework of existing heliports, where no other local guidance exists.

10 Airports and airstrips

If no local guidance exists, ICAO Annex 14, Volume I, *Aerodromes* [1] should be used.

11 Fuel system design, operation and inspection

For design/inspection/operational considerations of fuelling systems on airfields, heliports, helidecks and facilities, CAP 437, *Standards for Offshore Helicopter Landing Areas* [3] and National Fire Protection Association 407: *Standard for Aircraft Fuel Servicing* [10] should be used. These should also be used for construction or major rework of existing fuelling systems where no local guidance exists.

11.1 Design and periodic review

All preliminary and critical design processes for the construction or modification of refuelling systems on company airfields, heliports, helidecks and facilities should be subject to a review by the Member's Aviation Advisor.

All fuel and supporting fire suppression systems, including those provided by airports or fixed base operators should have annual safety, technical and quality assurance reviews by the appropriate regulatory authority or the Member's Aviation Advisor, and reviews every six months by the operator.

Records of such reviews and any remedial actions taken should be maintained.

11.2 Variances

Any variation to references [3] and [10] should be forwarded to the Member's Aviation Advisor.

11.3 General responsibilities and guidelines

a) The operator should have formal procedures detailing all necessary equipment checks and fuel system quality control measures.

b) The ultimate responsibility for the quality of fuel loaded onto an aircraft lies with the Captain of the aircraft.

c) Fuel delivery systems, including portable systems, should be fitted with a water blocking (Go–No–Go) type of filter meeting the specifications of API/EI 1583 [11].

d) Fuel filter canisters should be clearly marked with the next date of change or inspection cycle, and the data recorded in an appropriate inspection record.

e) Filters should be replaced at nominated pressure differentials as annotated on the filter housing or as recommended by the manufacturer, but should be replaced at least annually.

f) Fuel storage tanks, including drums, should be allowed to settle one hour for each 1 foot (300 mm) of fuel depth after the tanks or drums have been resupplied before samples are taken and the fuel is approved for use. Containers should have a sign placed on the tank during settling, indicating the time at which the tank can be used (settling complete). If the fuel system is serviced by only one tank, the fuel dispensing unit should also have a sign with wording as noted for the bulk tank.

g) If drummed fuel is used, the drums should stand (after moving) for one hour per foot (300 mm) of fuel depth before being used for refuelling an aircraft.

h) Tanks should be installed with a slope of approximately 1:30 and have a sump drain at the low point for sampling purposes. There should be a fuel quantity sight gauge.

i) The preferred plumbing for fuel systems, including tanks and piping, is stainless steel with welded connections where possible. If mild steel is used it must be coated with an approved epoxy liner.

j) Only personnel who have received formal documented initial and recurrent training should be used for conducting fuel quality checks and refuelling aircraft. Professional aviation fuel services can be of assistance in providing a training programme.

k) It is recommended that frangible 'witness' seals be used on tank openings, after filling to allow verification that contents have not been tampered with. This is especially important with transport tanks.

12 Fuel quality control

12.1 Fuel system sampling guidelines

The following fuel samples should be taken daily, with a minimum individual sample size as noted.

a) each fuel supply tank sump (2.0 litres)

b) each fuel filter and monitor (2.0 litres)

c) each fuel nozzle, prior to first refuelling of the day (2.0 litres).

The samples should be drained into a clear jar with a screw top, each tested for water, marked with the sample source and retained until flights are completed for that day.

It is recommended that the water test results be retained with the samples.

12.2 Transport fuel tanks

Fuel to be transferred into transport tanks from fuel trucks/bulk systems must be 'certified'. See 12.3.1 (Inspection). Before filling the tanks, a clear/bright and water test should be completed and results noted on the tank records. If the fuel does not pass these tests or is not from a "certified" source, then it should be rejected.

12.3 Bulk fuel inspection, testing and treatment

12.3.1 Inspection

As a minimum, the following items should be inspected as part of the fuel quality control:

a) records for each of the following quality checks

b) deliveries into fuel installations, including quantity, delivery date and copies of release notes or certificates of conformity

c) daily sample and water test results from the fuel tank sumps, all filters, monitors and fuel nozzle

d) differential pressure readings

e) fuel filter checks and changes

f) fuel density checks

g) microbiological contamination tests

h) fuel storage and delivery equipment inspections, including tanks, tank seals, pressure relief valves, hoses and ground/bonding continuity tests

i) calibration records for all gauges, delivery meters and pressure relief valves

j) bulk delivery fuel quality checks

k) quality checks for bulk fuel deliveries.

Bulk delivery fuel should have a Certificate of Release or Conformity.

Fuel should be sampled, visually inspected for appearance and contaminates, chemically tested for water and measured for density before delivery into storage tanks. Maximum variance of the density compared to the density on the Certificate of Release should not exceed 0.003.

Records should be maintained.

13 Microbiological contamination

13.1 Testing

Initial testing to establish 'normal' microbe level should be conducted: adopt a random routine testing of a few tanks on a quarterly basis. This should include primary supply tank(s), and several mobile tanks (if used).

Long-term testing: once the 'normal' microbe level is established as noted above, it is recommended that fuel supplies be tested on a six-month interval.

Fuel quality indicators: if any contra-indications from tank drains are apparent, such as dark coloured (brown, black) water, sulphide smells, water and fuel with a frothy or lacy interface, immediately conduct a test, as these strongly indicate microbial activity within the recent time span.

13.2 Microbiological growth treatment

If the microbe growth test is positive, use of the affected tank(s) should be suspended and the following protocol followed. Once the protocol has been followed then a repeat microbe presence test should be completed.

a) Bulk or transport tanks: full tank cleaning including disinfecting the tank surfaces with Chlorex bleach (or equivalent) followed by fresh water rinsing, inspect and replace all downstream contaminated filter elements.

b) Aircraft tanks and filters: filters should be replaced and tanks drained and cleaned following the manufacturer's recommendations.

c) Use of microbe treatments: any microbe treatments, such as 'BioBar' or equivalent should be used with caution and the aircraft manufacturer contacted to determine if the use of such treatments are allowed for that model aircraft's fuel.

14 Drummed fuel guidelines

The following precautions are applicable to operations that involve the use and storage of drummed fuel:

a) Drum caps should be tight with no broken seals prior to use.

b) Drum stock should be consumed within six months of packaging date.

c) Drums should be stored with the bungs horizontally at the 9 and 3 o'clock positions, with the bung end tilted slightly lower than the opposite (non-opening) end to minimize air and moisture exchange from the exterior.

d) After standing upright and waiting for the requisite period (1 hr/300 mm per foot of depth), each drum of fuel should be sampled and tested with a suitable water detection device or an approved paste to confirm no water contamination is present. A sample should be taken for visual inspection for the proper colour and absence of contaminates.

e) Pumps used for drum refuelling should be equipped with a water blocking filtration system.

f) Pump standpipes should extend no closer than 2 inches/50 mm of the drum bottom.

g) Before fuelling the aircraft, a small amount of fuel should be pumped into a container to remove any contaminants from the hose and nozzle.

h) Before refuelling from drums, full bonding/grounding procedures should be followed.

i) The standard marking for a contaminated drum is an 'X' marked on the bung end.

15 Portable offshore fuel transport tanks – Recommended minimum maintenance

See National Fire Protection Association (NFPA) 407: *Standard for Aircraft Fuel Servicing* [10].

15.1 Recommended minimum maintenance

Where the local authority has established a guideline, the most stringent standard should be used.

a) A five-year hydrostatic test is required on transport tanks. The data plate on the tank should state the test pressure requirement.

b) An annual test on the pressure relief valve.

c) Tanks should be inspected every 12 months.

   1) Check for build-up of sediment or evidence of microbial growth.

   2) If inspection reveals such growth or build-up of sediment exceeding 1/10 of the area of the tank bottom surface, cleaning should be accomplished.

   3) If the tank has an internal epoxy coating, inspect coating for evidence of chipping, flaking, or other deterioration.

d) Jet fuel tanks should be cleaned with high pressure water or steam only. Under no circumstances should solvents, chemicals, or detergents be used.

e) After cleaning with water, use squeegees and lint free mops to dry the tank surfaces. Assure removal of all free water, and allow the tank to dry thoroughly through natural ventilation as long as practicable.

f) Maintain a record of tank inspection and cleaning using ATA Form 103.07 or similar.

g) Dates indicating the inspection/test dates should be stencilled on the tank.

References

Only the current version of a reference should be used.

[1] ICAO. Annex 14 to the Convention on International Civil Aviation. Volume I. *Aerodrome Design and Construction.*

[2] ICAO. Annex 14 to the Convention on International Civil Aviation. Volume II. *Heliports.*

[3] UK Civil Aviation Publication. CAP 437. *Standards for Offshore Helicopter Landing Areas.*

[4] ICAO. Annex 3 to the Convention on International Civil Aviation. *Meteorological Services for International Air Navigation.*

[5] ICAO. *Airport Services Manual.*

[6] The National Fire Protection Association. NFPA 418. *Standard for Heliports.*

[7] International Maritime Organization. *Code for the Construction and Equipment of Mobile Offshore Drilling Units.*

[8] International Chamber of Shipping. *Guide to Helicopter/Ship Operations.*

[9] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[10] National Fire Protection Association. NFPA 407: *Standard for Aircraft Fuel Servicing.*

[11] API/EI. *Specifications and Qualification Procedures for Aviation Fuel Filter Monitors with Absorbent Type Elements.*

Further reading

UK CAP 168 – Licensing of Aerodromes.

IR-OPS CAT.OP.MPA.181.

UK Oil & Gas Guidelines for the Management of Offshore Helideck Operations.

Offshore Petroleum Industry Training Organisation (OPITO) Training Manuals and Courses.

Helicopter Safety Advisory Conference (HSAC) – Recommended Practice:

HSAC RP 2013-01, *Parking Area Design Guideline*
HSAC RP 2008-1, *GOM Helideck Markings.*
HSAC RP 2016-1, *Helideck Design Guidelines.*

Combined Federal Regulations (U.S. CFR 49, Part 173.32) and the Air Transport Association (ATA 103, Paragraph 2-11).

ICAO Heliport Manual.

Version 1

590-G
Recommended aircraft and personal equipment

Purpose

The purpose of this module is to provide guidance on the type and scale of equipment to fit to aircraft contracted by IOGP Members and the personal equipment that should be worn by passengers and crew.

Scope

This module of the Aircraft Management Guidelines (AMG) provides the recommended standards of aircraft equipment and technology for all types of aircraft as well as personal equipment.

This module applies to all Members and aircraft operators.

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1 Introduction and equipment fit tables

ICAO Annex 6, Part I, *Operation of Aircraft* [1] provides information on what equipment is required on certain types of aircraft and detailed requirements for the fitting of Flight Recorders, EGPWS and ACAS II in aircraft.

Equipment requirements for aircraft are an important consideration and can have an impact on the aviation portion of a project's budgets. Consequently, it cannot be overstated that the Aviation Advisor should be involved as early as possible and have a clear understanding of the project and the associated constraints. Ultimately, the goal is to correctly equip the aircraft to match the task, thereby enabling the crew to complete the job safely.

In determining appropriate aircraft and its equipment, several points need to be considered: project needs, the environment to be operated in, and the length of the contract.

a) Project needs should be clearly understood by the Aviation Advisor:

   1) Is the aircraft to fly cargo and or passengers?

   2) Will the operation include offshore operations or other specialized operations?

   3) Will the aircraft be used to provide medical evacuation support?

   4) How critical is aviation support to the overall project?

b) The operating environment for the project refers to the distinction between Hostile versus Non-hostile environment. See also 1.7 (Aviation weather guidance) and the definitions of **Hostile environment** and **Non-hostile environment**) in AMG 590-D, *Aircraft operations* [2].

   1) The Aviation Advisor should attempt to mitigate the risk of the operating environment with a properly equipped aircraft and appropriate SAR capability.

   2) AMG 590-D, *Aircraft operations*, 1.7, contains guidelines for planning and operational decisions in regard to weather, both adverse and routine, and the impacts of weather criteria on aircraft selection/operation. It is intended for use for all aircraft operations, both aeroplane and helicopter, and for onshore or offshore operations. AMG 590-S5, *Specialized operations: Hoisting* [3] contains considerations for SAR and requirements for helicopters providing SAR as a secondary role.

c) The length of contract is often a constraint, but it should not stop having the right equipment for a particular project. As a general statement, a long-term contract is one that is at least one year. However, the real deciding factor on aircraft equipment and ultimately aircraft performance is the operating environment.

The equipment specification of aircraft that are offered for use should be examined in detail to ensure that sufficient equipment of the right type is available for the tasks on which the aircraft will be used. This equipment is normally specified in the technical specification in the Invitations to Tender and, subsequently, in the contract.

In sections 2 and 3, information is provided to help in addressing what equipment should be on board contracted aircraft. Section 4 contains information on the personal equipment that should be required.

The equipment listed may in some cases be unserviceable and deferred (if allowed in approved Minimum Equipment Lists (MEL)). In these cases, it should be determined what impact that will have on contracted operations and a limit set for being out of service if authorized by the MEL.

Where ad hoc aircraft are brought onto an operation for short term use, e.g. to replace temporarily unserviceable contract aircraft or to meet short term surge requirements, they should as far as possible meet the long-term contract aircraft equipment requirements unless otherwise authorized by the Member's Aviation Advisor.

When several aircraft of the same type are contracted, the cockpit layouts should be standardized wherever practically possible.

Advice for providing the recommended equipment fit for helicopters and aeroplanes follow in Table 3 (Recommended equipment for aeroplanes and helicopters). They are not inclusive of every environment, but will provide a reasonable start point for most operations.

2 Minimum aircraft equipment – general

2.1 General description

Whilst regulatory authorities will not always require the carriage of the items of equipment described in the following sections in all aircraft, the requirements contained within this module should be applied to aircraft contracted to Members as detailed in Table 1.

Some equipment is legally required to be carried, but may have been mandated after the date of manufacture of the aircraft. In some instances, the retrofitting of such equipment may not be financially viable. The Member's Aviation Advisor should be consulted in such cases and a risk assessment conducted on whether to proceed with the use of these aircraft.

Some equipment is legally required under ICAO Annex 6 [1]. However, NAA requirements may differ from ICAO and the Aviation Advisor should take this into account.

2.2 Emergency Locator Transmitters (ELTs)

An ELT manufactured to TSO C126 should be carried on all aircraft, and in some areas, such as EASA Member State operations, an automatic deployment capability (ADELT) is mandatory. Ideally, such ELTs should be located in an area where they can easily be deployed or alternatively best protected in the case of an accident, e.g. dinghy packs and crew life jackets.

If automatically deployed, features should include crash switches, immersion switches, and the unit should be buoyant. If portable, they should have integral and self-deployable aerials.

The use of a TSO C126 ELT which utilizes 406 MHz signalling and satellite coverage to pinpoint its location geographically on land or in water if the aircraft is floating and identifies the aircraft by tail number is preferred by the IOGP. Each transmitter requires registration of the unit's owner and contact details and, in the case of fixed aircraft installations, the registration includes the aircraft tail number.

Points to note with respect to TSO C126 ELTs:

a) The aircraft's country of registration needs to be registered with the COSPASS/SARSAT system before the aircraft can be registered.

b) TSO 91 and 91a transmitters do not use 406 MHz, do not include aircraft identification and should no longer be used.

c) The 406 MHz ELT, beacons or radios operate to the optimum in countries which have registered for the satellite support, although they will give a position without aircraft identification anywhere in the world.

2.3 Underwater locator beacons (ULB)

An underwater locator beacon (ULB) or underwater acoustic beacon, also known as a 'pinger', is a device attached to aviation flight recorders such as the cockpit voice recorder (CVR) and flight data recorder (FDR).

ULBs are triggered by water immersion; most emit an ultrasonic pulse and are designed not only to survive accidents, but to function correctly after impact. This signal can then be detected by sonar receivers and used to locate aircraft wreckage underwater, thus assisting with recovery efforts and facilitating accident investigation.

If CVR and FDR are not fitted then, subject to advice from the Aviation Advisor, the pinger should be mounted to the airframe.

2.4 Search and Rescue Transponder (SART)

A Search and Rescue Transponder (SART) is a self-contained, waterproof transponder intended for emergency use at sea. These devices may be either a radar-SART, or a GPS-based AIS-SART (Automatic Identification System SART). The technologies are quite different but the way radar-SART and AIS-SART support search and rescue is very similar.

a) A SART responds to X-band radar found on most marine vessels and most search aircraft.

b) AIS-SART beacons are not radar transponders but instead send regular position reports through AIS by electronically exchanging data with other nearby ships, AIS base stations, and satellites.

Both types of beacons enable marine and aerial assets, including not only dedicated search resources, but also most commercial marine vessels, to become more effective search platforms. Either type of SART thus provides a significant and unique benefit in situations where there is reliance on marine search resources due to weather and water conditions.

2.5 Cockpit Voice Recorder (CVR)

See ICAO, Annex 6, Part I (Detailed requirements for Flight Recorders for aeroplanes and helicopters) [1].

In countries where airworthiness authorities do not have a requirement for CVRs, a CVR should be fitted as noted in Table 1.

Where possible, an underwater locator beacon (pinger) should be attached to the CVR as detailed in 2.3 (Underwater locator beacons).

2.6 Flight Data Recorder (FDR)

See ICAO, Annex 6, Part I for detailed requirements for Flight Recorders for aeroplanes, and ICAO Annex 6 Part III for detailed requirements for Flight Recorders for helicopters [1].

In countries where airworthiness authorities do not have a requirement for fitment of an FDR, an FDR should be fitted as noted in Table 1.

2.7 High Intensity Strobe Lights (HISLs)

Conspicuity of aircraft is significantly increased by the fitment and use of HISLs or equivalent forward recognition/pulse lights. These, generally white strobe lights, as distinct from the routinely fitted red anti-collision beacons, provide particular benefit when operations take place under VFR in congested airspace. They are an added benefit when lookout has to be shared between general surveillance and a particular task. Because of their intensity, restrictions should be placed on their use on the ground.

It would not be practical to insist on this equipment in areas where visibility is almost unlimited and traffic is of low density. However, in congested airspace they are considered essential, particularly at the lower levels where vertical separation and visibility is often reduced and radar surveillance may be poor or non-existent.

Accordingly, HISLs should be fitted if an approved installation is available for flights within Europe and where low level VFR flying takes place in and around built-up areas or on other high collision risk operations such as aerial pipeline patrols and traffic congested offshore areas. Areas of uncertainty should be referred to Members' Aviation Advisor.

2.8 Terrain Awareness Warning System (TAWS)

See ICAO, Annex 6, Part I [1] for detailed requirements for the fitting of EGPWS in aeroplanes.

Controlled flight into terrain (CFIT) is responsible for a large proportion of accidents. Terrain Awareness Warning System (TAWS) should be fitted as noted in Table 3.

It is essential that clear instructions and procedural guidance for crews on their response to the various WS alerts be laid down in Operations Manuals and/or Standing Operating Procedures.

2.9 Airborne Collision Avoidance System (ACAS)

Airborne Collision Avoidance Systems (ACAS) are commonly referred to as TCAS or Traffic Alert & Collision Avoidance Systems.

An ACAS/TCAS should be fitted as noted in Table 1. ACAS is required to be fitted to some aeroplanes. See ICAO, Annex 6, Part I [1] for requirements for the fitting of ACAS II in aeroplanes.

2.10 Flight Data Monitoring (FDM)

Flight Data Monitoring (FDM) is variously known as Operational Flight Data Monitoring (OFDM), Flight Operation Quality Assurance (FOQA), Helicopter Flight Data Monitoring (HFDM) and Helicopter Operational Monitoring Programme (HOMP) in various applications.

FDM is comprised of data collection hardware on board an aircraft, software to analyse downloaded data, and a programme to implement changes on individual and organizational levels. The system enables air operators to identify, quantify, assess and address flight operational risks. It is compatible with a proactive Safety Management System where it can provide assurance that safety levels are being met or improved.

A FDM programme should be implemented on all Fixed and Rotary Wing long term or repetitive short term Aircraft Services contracts, where such systems are available for the aircraft type.

2.10.1 Introduction

The requirements of the FDM programme for both fixed and rotary wing aircraft are similar. This section details the requirements, wider implementation guidance can be found in the IHST HFDM Toolkit [4].

The FDM programme should be 'just', meaning non-punitive unless criminal intent or wilful wrongdoing is evident, and shall contain adequate safeguards to protect the source data.

2.10.2 FDM system hardware and software

System type

There are a wide range of FDM systems available for both Fixed Wing (FW) and Rotary Wing (RW) aircraft types and the capability of these systems is continually changing.

In broad terms, they can be classified as follows:

- **Flight Data Recorder (FDR) based systems.** This also includes those systems that connect directly to a digital aircraft's data busses, rather than take information from the FDR. Typically, this type of system can record a wide range of parameters and is found on medium and heavy, digitally instrumented aircraft types.

- **Standalone and hybrid systems** that primarily record data from inertial reference instruments and self-contained sensors, but also have the capability to take data from a limited number of aircraft systems. Typically, this type of system records a limited range of parameters and is primarily used on legacy analogue aircraft and light aircraft types, although with a greater number of digital components on aircraft, a greater number of parameters can be recorded.

For contracted aircraft, the FDM system type used should be in accordance with Table 1.

Table 1: FDM system type for contracted aircraft

Aircraft type	FDM system
FDR equipped or capable FW and RW types	Integrated system recording data from the (CV)FDR or the aircraft data bus. The system used should be capable of meeting the event sets required for the role, with actual events sets specified in the contract.
Legacy analogue FW and RW types and light FW and RW types without an FDR.	Stand alone or hybrid systems which are based on inertial reference data, but also have the capability to record information from various avionic bus/systems, including pitot/static. The system used should be capable of meeting the event sets required for the role, with actual events sets specified in the contract.

All system installations must be approved in accordance with the applicable regulatory authorities' certification requirements. They must be fit for purpose and cause no detriment to the aircraft and the safety of its systems. Additionally, the FDM installation shall cause no harm to the data storage within the FDR, if fitted.

The hardware required for the FDM system is identified below:

Onboard data recording system

The recording system should be capable of storing sufficient data, relevant to the aircraft and system type and the data transfer procedures of the operator, to ensure all data from contiguous flights is processed and analysed. Recording devices should be capable of transferring the data to the media storage device without first holding it in any sort of buffering memory in case of the potential for data loss on sudden or inadvertent power failure. They should be fitted with some easy method of transferring the recorded data to the ground station.

Data transfer capability

The system is to have the practical capability for Pilots or line maintenance personnel to download the data at the operating base at least on a daily basis, but preferably between flights.

The download device should be capable of storing at least the total data produced by that aircraft system within the planned download period and ideally not less than 25 hours of flight data from continuous flights.

Temporary remote base operations will require, when operationally possible, the capability to transmit downloaded data to the FDM processing system or direct to a third party for analysis. Where it is not possible transmit the data over the internet, an alternative acceptable means of compliance should be established.

Ground station

An FDM ground station is required at every operating base where data downloads are required to be carried out. It must be capable of accepting data downloads and running the analysis software if the analysis is done on site. Alternatively, it must have the capability to transmit the data for offsite or third party analysis.

Data analysis system

The data analysis system and software used should have the following capabilities:

a) the ability to display information in a logical and user friendly way

b) the ability to programme a range of alert detection thresholds to generate events when parameters exceed preset values, covering aircraft flight manual limitations, operator flight profile requirements and SOPs

c) the ability to enable detailed analysis of the flight data

d) the ability to provide long term trend analysis of data.

Operators are to establish event thresholds within the system based on flight manual limitations, operator flight profiles and SOP's and these should reflect the specific operation roles undertaken.

Threshold setting

A minimum of three levels of severity of alert detection should be set for each event (low, medium and high) and these should be determined from the nature of the event, the magnitude of the exceedance and/or the potential consequences.

The severity levels in each case should determine the follow up action to be taken as outlined in Figure 1 (Generic FDM process).

A generic event list is detailed in Table 2 (Generic events for fixed and rotary wing operations).

Review and playback

The system should have the capability enable the effective review and debrief of Crews at all base locations, including permanent remote bases, using effective visualization software, including instrument panel graphics and displays of relevant aircraft systems.

This should include relevant data depicted on plots, presentation of the data as cockpit instrumentation relevant to the type flown, and showing a graphical depiction of the aircraft and location.

System serviceability

The Operators Minimum Departure Standards (MDS) or aircraft's Minimum Equipment List (MEL) should include detailed requirements for the airborne and ground elements of the FDM system.

This minimum standard should require:

a) the stated requirement for the data acquisition units, sensors and pick-offs and for the recording and download system (QAR), unserviceability should not exceed 25 flight hours between data downloads

   1) For long haul fixed wing operations, operating away from the main base for a short period, this may be extended to a Cat C (10-day item)

   2) This does not preclude the operator from having a procedure to grant an extension for its minimum departure standards, but will require senior Maintenance Management approval and shall include customer notification.

b) In-month the overall reliability rate for data downloads should be monitored and reported as a KPI. 95% or better should be targeted once the system is considered mature (after one year of operation).

Operators should take measures to assure the availability and functionality of the FDM analysis system by means such as service agreements with the equipment and software OEMs or the provision of back up equipment if necessary.

2.10.3 Support organization structure

The actual FDM organizational structure and numbers of personnel involved, whether full time or part-time, will depend on the operator's size and the number of aircraft covered by the FDM programme. However, it must take into account staff absence, leave and turnover, to provide sufficient cover.

The capabilities listed below may be completed by as few as two part-time individuals in a small operation or by numerous full and part-time personnel in a larger organization.

Larger organizations will be required to have a full time, dedicated Data Analysis capability as a minimum.

All those allocated to the above roles, including those required to have access to identified data, should be signatories of any confidentiality agreement required to protect the data.

The structure of the system/programme should include the following capabilities:

FDM Programme Manager

- An independent manager responsible for overall management of the system/programme.
- It should be an individual who is an experienced Pilot, who is respected and trusted by the Pilot workforce and is not part of the core senior management team. In very small organizations, this might be unavoidable.
- responsible for the timely provision of output from the system, sufficient to allow company management the opportunity to make informed decisions about the safety and effectiveness of the operation, for the classification of events, the completion of follow up activity and for producing periodic FDM reports for distribution within the organization regarding fleet wide trending information.

Pilot Liaison

- Experienced and trusted Pilot(s) responsible for informing Crews of threshold exceedence events, reviewing and explaining the data using playback and analysis software and feeding back Pilots responses to the analysis process.

Data Analyst(s)

- Individual(s) competent in the use of the system's data analysis software to set event thresholds, analyse downloaded data, determine event credibility and provide data in a format usable and easily understood for Pilot debrief and for de-identified FDM reports.

FDM Review Group

The FDM Review Group should be comprised of those members of the operation who have responsibility for operational standards and flight safety.

In large or medium sized operations, these could be the Chief Pilot, Head of Flight Standards, Flight Safety Officer, Training Captains and others as required. The HFDM Programme Manager should also be present along with any data analysts. In smaller organizations, this may only be the owner or managing director/CEO of the Company.

The group should have the following responsibilities:

- periodical review of de-identified FDM data findings
- determining and periodically reviewing the alert detection threshold positions
- making recommendations for changes to procedures and training to the accountable manager
- investigation of significant events discovered by the FDM Programme
- making the decision to remove the protection of confidentiality in cases of gross misconduct or continued non-compliance with SOPs. In such cases, crews would normally be interviewed and details may be passed to company management for action as necessary. In this way, the FDM Programme remains just as opposed to non-punitive.

2.10.4 Personnel training

Training should ideally be provided for all FDM posts, appropriate to their level of use. The data analyst needs to have 'relevant expert' levels of skill in working the systems, as should the FDM Manager. The pilot liaison positions will require knowledge of the review/playback systems and must be able to interpret data provided by the analyst. Line Pilots, or in some circumstances line maintenance staff, are likely to need only sufficient knowledge to download data.

However, all personnel are to have a full and clear understanding of what the system is designed to achieve in safety terms. Maintenance staff need to be able to test and assess the system's serviceability status and carry out associated maintenance.

2.10.5 FDM system process

The process detailed in Figure 1 should be followed by the operator. It is described in more detail in the following sections.

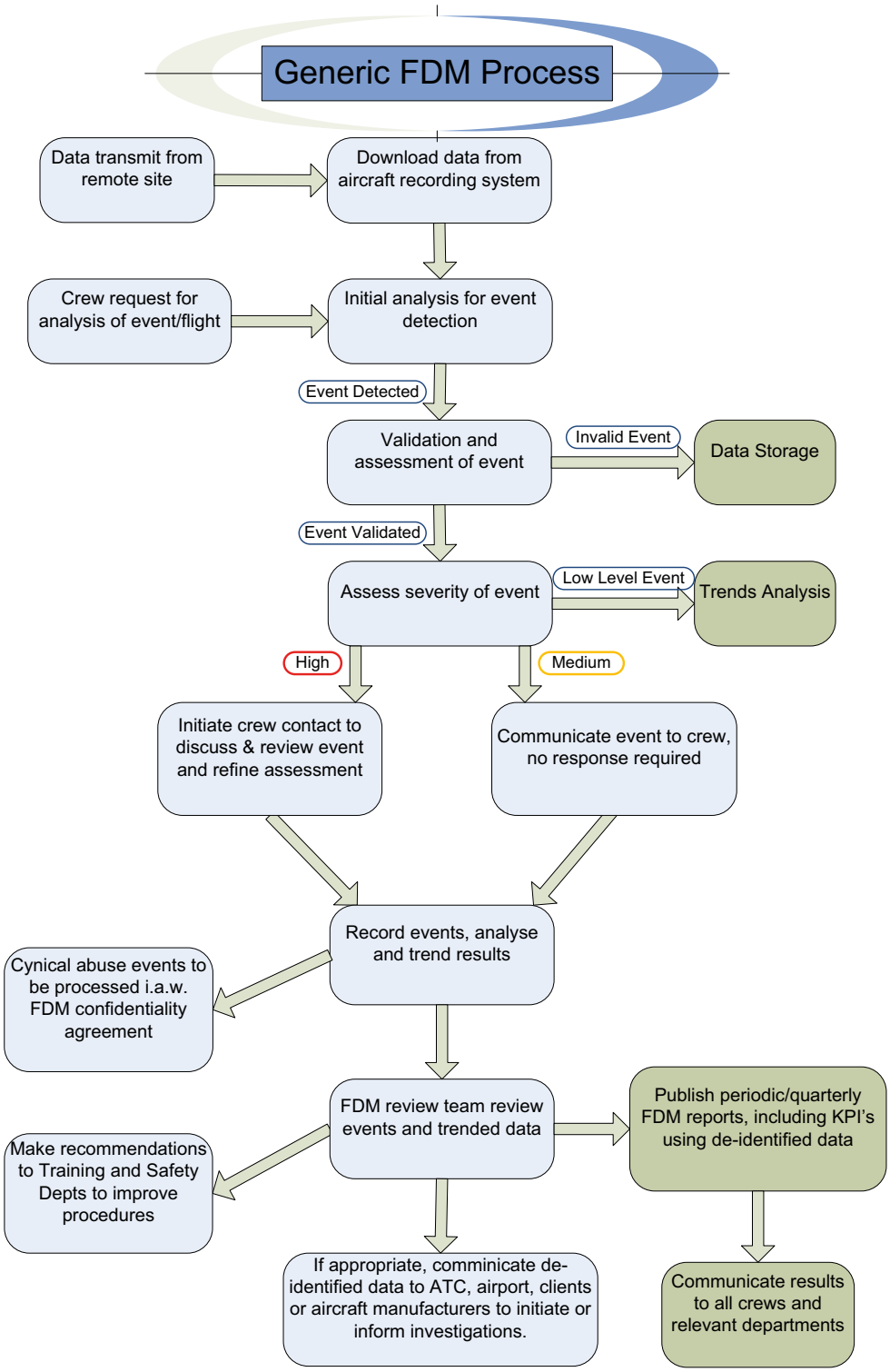


Figure 1: Generic FDM process.
Used by kind permission of the Global HRDM Steering Group http://www.hfdm.org/

2.10.6 Collect and process flight data

FDM data should be downloaded on a daily basis and preferably between flights, subject to the following exception:

- For FW aircraft operating on long haul flights away from base for a short number of days, the data can be downloaded on the return to base.

For FW and RW aircraft operating routinely from temporary remote bases, a means of downloading and transmitting the data on a daily basis should be established.

Successful data download rate from the operators fleet should be measured as a KPI.

2.10.7 Data analysis

FDM data should be analysed for threshold exceedance events on a daily basis (working days only) for both operator in-house data analysis and third party analysis services, subject to the following exceptions:

a) For FW aircraft operating on long haul flights away from base for a short number of days, the data can be analysed on the return to base.

b) For small operators, who have just one Pilot liaison/analyst, the analysis frequency may have to reflect that individuals work schedule. However, where practicable, redundancy should be provided by a second Pilot liaison/analyst.

c) Prior to applying the alleviations for FW and smaller operators, the option for third party analysis to achieve the daily requirements, should be addressed.

d) Small operators should consider using a non-Pilot staff member, whose availability is greater, to conduct a daily first look analysis of the data to establish whether any events have been recorded. They can then communicate the need for further analysis to the dedicated Pilot liaison/analyst. This additional staff member would have to be party to the confidentiality agreement.

The analysis of the data should include a process to validate events. For instance, certain events generated during maintenance test flights or training flights could be discounted.

2.10.8 Data storage and back-up

FDM data should be stored for a minimum period of 12 months and routine back-ups completed.

If storing data for a longer period, consideration may be given to de-identifying all the stored data after a defined period, to prevent future misuse by third parties.

2.10.9 Assess severity of events

All validated events should be assigned a severity based on the nature of the event, the magnitude of the exceedence and the potential consequences of the exceedence. The severity rating will determine the follow up action.

Operators should define their severity rating system and follow up requirements in the FDM Manual.

2.10.10 Crew contact

Every 'validated' and relevant Medium and High FDM event should result in a Crew contact. This enables Crews to be alerted to even minor departures from operating standards and ensures those events do not become normalized by lack of action.

For those events assessed as Medium Risk, this contact can be just an advisory contact by email or other means, to alert the Pilot or Crew of the event, but does not require further follow up action.

- This action could be completed by the individual performing the analysis, subject to the confidentiality conditions.
- For events assessed as High Risk, a more comprehensive contact should be required that involves dialogue between the Pilot Liaison function and the Crew involved.
- This contact should include a review by the Crew of the data for the event, using the playback capability and a discussion with the Pilot liaison.

For remote operations from temporary bases, face-to-face briefing with Pilot liaison personnel and the full use of the analysis playback and review capability may not be possible, but operators should use the most appropriate means practicable to communicate the event and its consequences to the Crew.

Operators should have in place a process for Crews to request analysis of a particular flight or event.

The operator should also have in place a procedure to decide when information on a high risk event may be required to be communicated to other departments. Any such communication shall abide by the confidentiality agreements in place for the transmission of FDM data.

The FDM system can also be used as a debrief tool for programmed training flights, provided this has been previously agreed and documented as a procedure.

2.10.11 Cynical abuse action/policy

In the event of repetitive, deliberate violations of SOPs and limitations and/or unprofessional, reckless behaviour (cynical abuse), the operator should have a procedure detailed in the confidentiality agreement that will enable escalation and in certain defined circumstances, disciplinary or administrative action to be taken.

2.10.12 Perform trend analysis and record results

Trend monitoring should be undertaken as a routine part of the process to give advance warning of developing issues in a flight operation.

Following analysis of the FDM data and, when necessary, further investigation and crew contacts, the results should be recorded and stored in a format that enables future access for reference and comparison.

Once FDM trend monitoring has been established, Key Performance Indicators should also be used to measure the effectiveness of the FDM system and any follow up actions taken.

2.10.13 Periodic review

The FDM Review Group should meet at regular intervals (Quarterly recommended) to review FDM results and make recommendations for suggested changes to operational procedures or training syllabi. A procedure should also be put in place to track the implementation of those recommendations and a monitoring process to determine their effectiveness. An overview of these actions, together with the Key Performance Indicators, should be included as an agenda item in the operator's periodic Senior Management Reviews, alongside the Safety and Quality Assurance (QA) summaries.

2.10.14 Communicate results

All communication and transfer of FDM data and information must conform to the operator's confidentiality agreement.

The FDM Manager should produce regular FDM reports, summarising event activity within the organization and highlighting trends from the analysis. These reports, which can be in the form of newsletters, should be made available and communicated to all crews and relevant departments.

The information contained in the reports/newsletters must be de-identified so that a wide distribution within the organization can be achieved.

When considered appropriate by the operator, de-identified FDM information can also be communicated to outside organizations such as ATC, airports, customers and aircraft manufacturers, if required to initiate or inform safety investigations of changes of procedures within that organization.

2.10.15 Program Audits – Internal and External

The FDM system should be subject to the operator's internal audit QA process, using acceptable means that do not risk the independence and security of the FDM program, especially in smaller operations where some positions may be combined.

IOGP Companies requires the right to audit sufficient aspects of the FDM system to assure that the process is working and adding to the advancement of safety. This will not give right of access to all the data, especially that which is identifiable to an individual, unless the aircraft operator specifically wants to use the data to demonstrate a specific issue.

2.10.16 FDM generic event list

Table 2 lists generic events for fixed and rotary wing operations.

The specific parameters required to create those event are not listed, but need to be determined by aircraft type and equipment fit. Further guidance is given in the GHFDM Best Practice Manual or by reference to specific OEMs. Not all aircraft types will be capable monitoring all events.

The list is not exhaustive and should be tailored for specific operations.

Those events required for a specific operation/contract, should be specified in contract documents.

Table 2: Generic events for fixed and rotary wing operations

Ground			
All			
OAT High – Operating limits	Ground Taxi Speed – max	High Lateral Acceleration (rapid cornering)	High Longitudinal Acceleration (rapid braking)
Rotary Wing			
Sloping Ground High Pitch Attitude	Rotor Brake on at excessive NR	Excessive power during ground taxi	Pedal – max LH & RH taxi
Sloping Ground High Roll Attitude	Air Taxi Speed – Max	Cyclic movement limits during taxi (pitch or roll)	Excessive yaw rate on Ground in taxi
Excessive Rate of Movement of Longitudinal & Lateral Cyclic on Ground	Lateral Cyclic – closest to LH & RH Rollover	Excessive Cyclic Control with Insufficient Collective Pitch on Ground	Yaw Rate in Hover or on ground
Inadvertent Lift off			
Flight - Take off & Landing			
All			
Day or night Landing or take off	Landing or take off specific location	Heavy/hard landing	Excessive tail wind on take off
Gear extension & retraction – Airspeed limit	Gear extension & retraction – Height limit		Excessive tail wind on landing
Rotary Wing			
Cabin Heater On (take-off and landing)	High Groundspeed Prior to TD	Airspeed on Departure (≤300 ft)	Downwind Flight Within 60 seconds of Take off
Downwind Flight Within 60 seconds of Landing	Excessive pitch on transition	Excessive pitch on flare	
Fixed Wing			
High Speed on lift off/rotation	Excessive pitch rate on rotation	Excessive pitch angle on take off	Rejected take off
Early configuration change on initial climb	Low speed on landing	Long flare	Long landing distance
High speed on landing	Late configuration setting on landing	Go around	Touch and go
Flight – Approach (Stabilized approach)			
All			
Heading Change below specified heights	Angle of Bank at specified heights	High speed/ IAS at specified heights	Low speed/IAS at specified heights
ROD at specified heights	Stable Approach – late turn	Premature Turn to Final	Stable Approach Track Change
Glideslope deviation above specified height	Glideslope deviation below specified height	Localizer deviation above specified height	Localizer deviation below specified height
Low Turn to Final			

Rotary Wing			
Pitch Attitude change at specified heights			
Fixed Wing			
Speed high for specific flap configurations (×3)	Pitch cycling during final approach	Height high 1 min before landing	Height low 1 min before landing
Windshear warning			
Flight – Cruise			
All			
High Airspeed - Low Altitude	Airspeed – VNO/VMO/VNE speed exceedances	Low airspeed at altitude	
Altitude Maximum	Climb Rate – max		
High Rate of Descent	Low Cruise	High positive vertical acceleration (g)	High negative vertical acceleration (g)
Altitude alert during cruise	Excessive Pitch angle in flight	Excessive Pitch Rate	Excessive Roll/bank Attitude
Excessive Roll Rate	Excessive Yaw rate	Pilot Workload (e.g. Turbulence)	OEI – Air
Pilot Event	TCAS alerts	Training Mode Active	Fuel content low
EGPWS alerts - various	Bleed Air system use during take-off (e.g. Heating)	Condition of Autopilot in Flight	AP Engaged within specified time after Take-Off
Autopilot Engaged on Ground (post or pre)	Airspeed Hold Engaged – Airspeed	Airspeed Hold Engaged - Altitude	ALT Mode Engaged – Altitude
ALT Mode Engaged – Airspeed	HDG Mode Engaged – Speed	V/S Mode Active – Below spec speed	VS Mode Engaged – Altitude
FD Engaged - Speed	FD Coupled Approach or take off - Airspeed	Go Around Mode Engaged - Airspeed	Flight without ASE channels engaged
Engine operating limits – various			
Rotary Wing			
Low Airspeed at altitude (High hover)	High Airspeed – Power Off	Minimum Altitude in Autorotation	Settling with Power (Vortex ring)
Excessive Lateral Cyclic Control	Excessive Longitudinal Cyclic Control	Excessive Collective Pitch Control	Excessive Tail Rotor Control
Cross Controlling	Quick Stop	Torque Split	High/Low rotor speed – Power On
High/low rotor speed – Power Off	AVAD alert	Rotors Running Duration	Excessive Pitch Attitude with AP Engaged on Ground (Offshore)
NG/NR operating limits	Gearbox/Torque operating limits		
Fixed Wing			
High vertical speed before level off			

2.11 Survival kit

All aircraft should carry safety equipment and survival kits that at least conform to NAA regulations. The capacity of each survival kit should be proportional to the number of persons carried in the aircraft.

Members should require additional survival equipment appropriate for the geographical location and climatic conditions, e.g. offshore, Arctic, jungle or desert should a risk assessment determine this to be necessary.

2.12 Over water flights – all aircraft

Operations over water using single engine float planes or aeroplanes that are not able to maintain a net climb gradient on a single engine require special considerations for safety and survival equipment such as life rafts, immersion suits and life jackets.

All aeroplanes should be equipped with life rafts in sufficient numbers to carry all persons on board, stowed to facilitate their ready use in emergency, and provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken.

For helicopters and more detail on life rafts and life jackets, see 3.2 and 3.3 respectively in section 3 (Helicopter equipment), and immersion suits (4.2) in section 4 (Personal equipment).

2.13 Handheld microphones

In some regions, intercom systems are rarely found in aeroplanes, and the use of hand-held microphones is widespread. This practice is not recommended even in the case of two-crew aircraft and the use of headsets is preferred. All single pilot operated aircraft should be equipped with headsets and control column mounted transmission switches.

2.14 Cargo and cargo restraint system

Whenever possible, cargo should be carried in a compartment approved for carriage of cargo and, where available for the aircraft model, equipped with an independent fire and smoke monitoring and extinguishing system. If it is unavoidable that cargo is carried in the passenger compartment, it should be adequately restrained and not obstruct any exit.

Apart from the considerations for the handling of dangerous goods it is essential that all cargo be securely tied down in the aircraft. Each item of freight should be weighed and manifested accordingly to enable the pilot to calculate the weight and balance and performance requirements correctly and thus ensure adequate safety margins in the event of engine or other system failure.

Only authorized aviation personnel should secure and remove cargo and baggage. This is particularly important during times when the aeroplane or helicopter has engines/propellers/rotors running.

2.15 First Aid kits

Comprehensive First Aid kits should be carried on all aircraft. The number of FA kits and the contents should be commensurate with the seating capacity of the aircraft.

2.16 Sideways-facing seats

Unless sideways-facing seats can be repositioned in either the forward or aft position, their use should be avoided during take-off and landing unless shoulder restraints are used and correctly tensioned, passengers are briefed accordingly and the modification or configuration is approved by the NAA.

3 Helicopter equipment

3.1 Health and Usage Monitoring System (HUMS), Vibration Health Monitoring (VHM) and Usage Monitoring System (UMS) guidelines

See UK CAP 693 [5] and FAA Advisory Circular AC 29-2C [6] for basic references on HUMS), EASA AMC & Guidance Material (GM) to Part-CAT [7] for basic reference for applicability of HUMS. See also CAA CAP 753 [8] and HeliOffshore *HUMS Best Practice Guidance* [9] (latest version).

3.1.1 HUMS

Typically, a HUMS incorporates basic vibration analysis using a Vibration Health Monitoring (VHM) system which includes the equipment, techniques and/or procedures by which incipient failure or degradation of the helicopter rotor and rotor drive system components can be determined and is coupled with the aircraft flight data recorder for monitoring of other aircraft systems including propulsion.

By continuously monitoring vibration at critical points on an aircraft, HUMS provides actionable information so operators can make data-informed decisions.

HUMS is increasingly effective in providing additional data on emerging technical issues and, with the development of Advanced Anomaly Detection (AAD), which will provide a greater diagnostic ability than a basic system, the accuracy and predictability of HUMS will continue to improve.

3.1.2 Scope

VHM and UMS

A VHM system monitors vibration data of the following, using a combination of spectrum analysis and advanced diagnostic (proprietary signal processing) techniques:

a) This will also include a diagnostic capability for every dynamic component in the drive train

b) engine to main gearbox input drive shafts

c) main gearbox shafts, gears and bearings

d) accessory gears, shafts and bearings

e) tail rotor drive shafts and hanger bearings

f) intermediate and tail gearbox gears, shafts and bearings

g) main and tail rotor track and balance

h) engine health.

Helicopters with 10 or more seats

For helicopters type certificated for 10 or more seats, a full HUMS should be fitted. Alternatively, as minimum, VHM coupled with an engine Usage Monitoring System (UMS) should be fitted as noted in Table 3.

Helicopters with 9 or fewer seats

For helicopters type certificated for 9 seats or less HUMS; a basic VHM of the driveline/turning components and an engine UMS should be fitted, as noted in Table 3.

3.1.3 Technical requirements

Download and primary analysis

The HUMS download and initial analysis result should be recorded and certified in the aircraft technical log or similar document where the Certificate of Release to Service, is recorded.

The aircraft dispatch procedure for flight following the download and initial analysis should detail and include the following requirements for action

- **Where there are no HUMS alerts** – the aircraft is clear for dispatch with no further action.
- **With a yellow, amber or intermediate HUMS alert** – the dispatch of an aircraft with an existing alert is to have been subject of either a maintenance action which is recorded and certified, or to control process within the operators continued airworthiness organization, a record of which should be in the aircraft approved documentation. Additionally, full serviceability is required on any component of the HUMS system associated with that alert.
- **With a red or high HUMS alert** – the aircraft is not to be dispatched until a full analysis and, where necessary, maintenance investigation has been completed and any subsequent action certified.

Download periodicity – Normal monitoring

The HUMS should be downloaded and an initial line analysis, to review threshold alerts, conducted at the following periodicities:

a) For Offshore Flights – on every return to the operating base (bases should be defined in Member Contracts), whether for passenger or crew change or for shut down

b) For operations where the aircraft routinely returns to the operating base at a high frequency, due to short sector lengths, the download frequency can be extended out to a period not exceeding 5 hours of elapsed flying time

c) Where aircraft are based offshore, in remote locations, or detached to another base, arrangements should be made using portable ground stations and platform internet connections to provide an equivalent capability where practicable. The total time between downloads should be at a minimum daily, out to a period not exceeding 10 hours of elapsed flying time

d) For Onshore flights – the system should be downloaded daily as a minimum, but where practicable on every return to the operating base

e) For Onshore flights over hostile onshore terrain, the offshore requirement of download on every return to base should be adopted

f) For IOGP SAR operations, local procedures should be documented to allow for authorization at senior management level (i.e. Operations Manager, Director of Maintenance or similar) for extension of these periodicities, where life may be endangered by any delays caused by HUMS downloads.

3.1.4 HUMS Data Collection

The HUMS should be capable of generating a warning that indicates no data has been acquired on any parameter for a period of ≥5 hours of elapsed flying time. If a specific system does not have this feature or equivalent functionality, the operator should have a process to confirm the required data has been collected.

If the aircraft has not been in the required flight regime for a sufficient period of time, it is acceptable to have collected a partial HUMS data set. However, a complete HUMS data set must be collected within a period not exceeding 10 hours of elapsed flying time.

3.1.5 Unserviceability/MEL/MDS

The operator should define a Minimum Equipment List (MEL), Minimum Departure Standard (MDS), or equivalent document. This document should detail the HUMS equipment that may be temporarily unserviceable, and include associated operating conditions, limitations, or procedures as applicable.

System unserviceability and subsequent deferment of unserviceable channels should be based upon the following, and the deferment period for individual channels should be tracked as separate defects.

The MEL/MDS should limit the unserviceability as follows:

a) The main system, i.e. Data Acquisition Unit or Data Acquisition Processing Unit (DAPU), Bearing Monitor Unit (BMU) or similar, should be serviceable.

b) When the HUMS data cannot be downloaded for technical reasons, such as a card failure or similar and the problem has been identified, an entry should be made in the aircraft paperwork (technical log or similar) to allow one further flight to be completed to validate the system.

c) The unserviceability or unavailability of any other single component of the system, including individual accelerometers, should be:
   - **Failure while Close Monitoring**: 0 (zero) flying hours
   - **Failure while under Normal Monitoring**: 10 flying hours.

d) When released to operate with a yellow, amber or intermediate threshold exceedance or when a specific component is placed under close monitoring for other reasons, full serviceability or availability should be required on the relevant HUMS components, including individual accelerometers.

3.1.6 Training, support, Quality Assurance

For guidance on processes that should be in place with an operator, the following areas in the HeliOffshore BPG [9], with brief descriptions, should be followed:

a) **Acronyms** – Typical HUMS processes, etc.

b) **Definitions** – Including personnel typically authorized to review, analyse and certify HUMS data

c) **Scope** – Clarification of terms, etc.

d) **Ground Station Software and Data Management** – Databases, Hardware processes etc.

e) **Download and Primary Analysis** – Excepting areas above where additional IOGP guidance is provided

f) **Communication** – Internal, External, etc.

g) **AAD and Web Portals** – Interconnectivity, System Use, OEM Instructions

h) **System Performance Reports** – Original Equipment Manufacturer/ Overhaul Facility Support, Defect Trending Reports

i) **Responsibilities and Process Descriptions** – HUMS Staff responsibilities, Process descriptions, etc.

j) **Training** – Defines training for all staff

k) **Management Oversight** – Corporate Oversight, Departmental Oversight, Line Level Oversight

l) **Quality Assurance** – Audit Plan, Documentation, etc.

m) **Appendices** – Include QA Checklists for HUMS.

3.2 Life rafts

All life rafts should be equipped with an ELT or radio that is waterproof (non-voice systems are acceptable) and with an approved offshore survival kit. All loose equipment should be attached to the raft with a lanyard.

Exception: Single piloted helicopter survival kits may be located separately in the front cabin area to provide ready access by the pilot or front seat passenger.

Helicopters having a seat capacity for 10 or more passengers should have two life rafts; each should be certified for 50% overload to enable any one life raft to be used by all occupants. *As an example: For a helicopter with a capacity of 12 occupants, each life raft should be certified for 18 persons (12 + 6).*

Helicopters having a seat capacity for 9 or less passengers should have a minimum of one life raft certified to carry all occupants without an overload condition.

Where available by helicopter model, externally mounted life rafts are preferred over those internally mounted. The IOGP recommends a helicopter installation whereby:

a) primary deployment is by single action from the normal crew positions

b) secondary deployment is from the passenger compartment with the cabin in an upright attitude; and

c) deployment is possible from outside the helicopter when in either an upright or inverted attitude. In this case the life raft is mounted externally on the helicopter. This is the preferred installation on long-term contracts.

3.3 Life jackets

See also 1.5.9.1 (Helicopter Underwater Escape Training) of AMG 590-C, *Personnel qualifications and training* [10].

For all helicopters, single engine aeroplanes and multi-engine aeroplanes that cannot achieve a net climb gradient on one engine, conducting operations over water beyond gliding distance of land, constant wear type life jackets should be worn by all occupants. Constant wear life jackets should be covered with a durable fabric to reduce damage from continual handling and be fitted with a light and a whistle.

For all other aeroplane extended operations over water, life jackets should be available and readily accessible for use by passengers and crew in the event of a ditching.

Life jackets need not be provided if immersion suits equipped with integral vests are used.

Pilot life jackets for offshore helicopters or remote areas should contain an emergency radio (PLB).

3.3.1 Life jackets – Approved types

Only those life jackets that are manufactured to an aviation authority approved TSO and certificated for use by the regulatory authority should be used.

The following points should be noted.

a) Permanently buoyant vests should not be worn or provided to occupants on aircraft flights because these types significantly hinder egress from a submerged helicopter or aeroplane. This is the same reason why life-jackets should never be inflated until well outside of the helicopter or aeroplane cabin.

b) Life jackets with crotch strap designs are preferred over those without.

c) Rebreather systems and pressurized underwater breathing devices (collectively known as Emergency Breathing Systems (EBS) for life-vests and/or immersion suits which are designed to provide additional time for underwater egress may be designated for use, but a suitable training programme should be established. These systems should have appropriate approval for use by the local regulatory authority. See 3.3.2.

3.3.2 Emergency Breathing Systems (EBS)

See also 1.5.9.1 (Helicopter Underwater Escape Training) of AMG 590-C, *Personnel qualifications and training* [10].

The decision to use EBS devices should only be made after a risk assessment to include at least the following topics:

a) environmental factors such as water temperatures, typical wave patterns, night or day flight, etc.

b) aircraft ditching/egress history

c) compatibility with life jackets and/or immersion suits

d) additional training risks versus benefits

e) aircraft configuration factors such as the size of the aircraft, ease of underwater escape, fuselage floatation certification for differing wave conditions and interior cabin lighting

f) other factors such as the percentage of night flying carried out, the potential for EBS misuse and added anxiety.

A suitable training programme should be established before use/issuance of EBS as it can pose additional risks if the user is not properly trained (EBS with compressed air in particular).

Some systems do have provision for use of 'dry' training to allow use pending 'wet' dunker training with EBS.

Members should consult with the manufacturer of the devices for specific requirements, but the following are the minimum 'wet' training requirements:

a) donning of an aviation life jacket, EBS equipment and correct operation

b) verifying the integrity of the EBS equipment

c) carrying out breathing actions using EBS equipment at atmospheric pressure in dry conditions

d) carrying out breathing actions in a pool environment utilizing personal air (should experience positive and negative pressure created by body orientation in the water)

e) occasions for use and correct sequence of operating the equipment

f) limitations.

Particular attention should be given to ensuring training devices are sanitized between use and any microbial residue completely neutralized. Involvement by the Member's health specialists should be considered for this aspect.

Some immersion suits do not have integral life jackets and may lack adequate buoyancy, consequently a separate life jacket may need to be worn externally. A crotch strap may be necessary for adequate security of these separately worn jackets.

The manufacturers and NAA should be consulted as necessary for clarification.

3.4 Helicopter flotation gear

See ICAO Annex 6, Part III [1] for requirements for when helicopters shall be fitted with a means of floatation.

Unless helicopters have a boat hull or are fitted with fixed floats, they should be fitted with emergency floats that are automatically inflated on contact with water.

3.5 Cabin push-out windows, emergency lighting and seating layout

As a result of a series of underwater egress trials conducted on representative offshore helicopters, IOGP has identified additional requirements for windows, emergency lighting and seating layout:

a) All apertures in passenger compartments suitable for the purpose of underwater escape should be able to be opened in such an emergency. Push-out rubber mounted windows are the preferred standard where available for the aircraft model.

b) Emergency exit marking systems (i.e. EXIS or HEEL path lighting) should be available on night flights and be automatically activated following the flooding of the cabin.

c) Seat rows should be aligned with windows.

3.6 SAR Support Equipment for Helicopters

See also section 10 (Search & Rescue (SAR) services and equipment) of AMG 590-B, *Safety Management System, Quality and Emergency Response* [11] for guidance on SAR and training.

3.6.1 Homing receivers

Three types of homing (direction finding) receivers are available to assist in locating missing aircraft or personnel transmitting on emergency frequencies.

1) Sonar 'Pinger' homers are used for locating a submerged aircraft

2) ELT and beacon homers are used for locating a downed aircraft on land or floating in water

3) radars on aircraft or vessels can be used to locate SARTs. See 2.4 (Search and Rescue Transponder).

If not available by SAR agencies for either water or land in the country of operation, these homing devices should be added as a contract specification or included in company owned equipment.

3.6.2 Rescue hoists

See also 1.5.9.6 (SAR winch/hoist operations) and 3.10 (SAR Crewmen), both in AMG 590-C, *Personnel qualifications and training* [10]. See also AMG 590-S5, *Specialized operations: Hoisting* [3].

The role of rescue hoists for Search & Rescue purposes in emergency response planning should be carefully evaluated and a risk analysis completed with the assistance of the Member's Aviation Advisor.

When considering rescue hoisting as a secondary role for helicopters, it should be borne in mind that the operator should have the ability to perform competently and to complete periodic training to support the hoisting role given the parameters established in the ERP. Such programmes for offshore rescue should include training over open water in reduced visual reference conditions. See 1.5.9.1 (Helicopter Underwater Escape Training) in AMG 590-C [10].

It may be more practicable to provide a linked life raft system, as noted in 3.6.3, rather than to provide a rescue hoist if the risk analysis supports this decision. Nonetheless, both are demanding tasks when conducted over open water and periodic training should be undertaken.

3.6.3 Linked raft rescue system

Description

For long term operations, it is recommended that Members, in conjunction with the operator, consider the use of a 'Linked Raft Rescue System' in their emergency response planning.

The system would be used as part of the survival equipment in the event Helicopter Hoist.

Operations (HHO) is not readily available or when the possibility exists that personnel may not be recovered from the water within anticipated survival times.

Systems are available that can be deployed from helicopters or suitably equipped fixed-wing aircraft.

The system consists of:

a) two rafts linked together with two fifty meter lengths of buoyant nylon rope

b) two floating smoke canisters

c) one knife for cutting the rope if necessary

d) leather gloves for deployment

e) positive intercom communications between the pilots and deployment person.

The rafts are air dropped upwind from the rescue zone and drift in a semicircular manner to surround those survivors in the water. The system assists in directing the survivor by means of the floating rope to one of the two rafts.

The object is to secure personnel as quickly as possible into life rafts as a first step in the recovery process. Additional information on this equipment and procedures for its use is available from the Aviation Advisor.

Training

See also 1.5.9.6 (SAR winch/hoist operations) and 3.10 (SAR Crewmen), both in AMG 590-C, *Personnel qualifications and training* [10].

This system should only be used if the aircraft crew have been trained in the physical deployment of the system over water. Annual recurrent training is recommended.

The system should only be deployed from a dual piloted, twin-engine helicopter or suitably equipped aeroplane and with an individual trained in its deployment in the rear of the aircraft.

3.6.4 Warm-up clothing

Suitable clothing that rescued personnel can change into as soon as practicable after rescue, such as sweat suits or blankets should be located in a waterproof container with other rescue equipment.

3.7 Medical aircraft configuration

3.7.1 General

The aircraft should carry sufficient medical equipment appropriate to the identified patient problem.

All aircraft of the same type should be outfitted in the same manner as far as is possible.

a) All aircraft modifications should be subject to approval by the State of Registration.

b) All equipment and supplies should be properly secured to the extent that they will not break free in turbulence or in an accident.

c) Medical equipment should be able to function without interfering with the aircraft's avionics or electronics, nor should the avionics or electronics interfere with the functioning of the medical equipment. Only equipment which is certified by the manufacturer as being fit for aircraft use should be used. Equipment should be tested in the aircraft prior to use.

d) No item in the cabin should be positioned so as to cause an injury to the occupants.

e) No item should be positioned in such a manner that restricts access or egress in an emergency, nor restrict access to emergency equipment.

f) Normal access to the cabin should allow manoeuvring of the patient without compromising patient stability or the functioning of medical equipment.

g) All the equipment should be capable of rapid installation and removal.

3.7.2 Patient restraint

Patient stretchers should be purpose made for air transport (e.g. Ferno or equivalent, or basket stretcher).

It is desirable that the head of the stretcher should be capable of being elevated up to 30° for heart patients.

Preferably, the stretcher should be secured by means of hard mounting points rather than straps. It is recommended that if the aircraft configuration allows, a stretcher mount which fixes to the aircraft hard points and has quick release clamps to fix the stretcher itself is used to raise the stretcher off the cabin floor.

The stretcher and its mounting system should be strong enough to support a 120 kg person and sufficiently rigid to withstand the forces incurred during cardio-pulmonary resuscitation.

Stretchers should be secured in such a manner that they can be rapidly removed from the aircraft in an emergency.

The pilots, aircraft controls and radios should be physically protected from any intended or accidental interference by the patient, medical personnel or equipment.

In order for there to be access and space to ensure the patient's airway can be maintained and that adequate ventilation support can be given from the secured, seat-belted position of a medical attendant, the stretcher should ideally be positioned so that a medical attendant is able to sit behind the head of the patient.

Patients should be secured to the stretcher with straps complying with the requirements of the State of Registration. Injuries permitting, a five-point restraint system is highly desirable to prevent a prone patient from sliding out from under lateral straps in the event of an accident or turbulence.

3.7.3 Oxygen

Gas cylinders are pressurized containers and may be classified as hazardous cargo in certain regulatory jurisdictions. The operator should be authorized to accept such items for shipment by air and have established procedures for flight crew. Any installation for mounting the cylinders should be approved by the State of Registration.

Portable cylinders should be firmly secured in a mount during flight; a loose pressurized gas cylinder is extremely hazardous. They should be positioned in such a way that no part of the fitment constitutes a hazard to the occupants. Pressure gauges should be visible to the user, and shut-off valves should be readily accessible, as should be any change-over valves.

Only cylinders that are certified by the manufacturer as being suitable for use at the aircraft's operating pressure altitude should be used. The aircraft operator or the medical provider (whichever is responsible) should ensure that all oxygen and other gas cylinders are subject to an annual visual and five-yearly hydrostatic inspection by an approved testing facility.

Records of this inspection routine should be kept.

3.7.4 IV fluids

IV fluids should preferably be positioned at a higher elevation than the patient and provision should be made for this. An adequate supply of conveniently placed hangars or hooks should be available which are quickly and easily installed and removed.

All such supports should be soft, padded or flush mounted to prevent head trauma to the occupants in the event of a hard landing or emergency. Hangars or hooks for IV fluids should be designed so as not to accidentally release in the event of turbulence or a hard landing.

In the unlikely event that glass IV containers are requested, they should not be used unless required by medical specifications and it is absolutely unavoidable.

3.7.5 Cardiac monitoring and defibrillating equipment

The cardiac monitor and defibrillator should be so positioned that the screen can easily be read and the machine is readily accessible.

3.7.6 Lighting and electrical

Adequate lighting should be provided in the patient care area during night operations. Portable lighting for use in the event of a failure of the main system should be provided.

The cockpit should be screened (using a quick install curtain or alternate means) from lights in the patient care area. If this is not possible then only a red light of low intensity should be used in the cabin.

Depending on the length of flight envisaged compared with the battery life of the medical equipment, electrical outlets meeting the requirements of the specialised medical equipment should be provided (28 V and 12 V DC, and 115 V AC). They should have sufficient capacity to power the complete medical package without compromising the operation of the normal aircraft equipment.

3.7.7 Additional considerations

A fire extinguisher should be located so as to be accessible to the medical attendants.

Some IV fluids, blood and other body fluids are corrosive. Consideration should be given to protecting the aircraft floor if spillage is likely (e.g. major trauma).

3.7.8 Seat belts and shoulder harness

Medical attendants should always wear seat belts and shoulder harness for take off and landing. Full restraint should be used as much as possible during flight, only being removed when patient care is impossible without doing so.

4 Personal equipment

4.1 Personal locator beacons (PLB) and emergency radios

Small handheld PLBs are available, and some models offer both voice capability and 406 MHz capability. Voice capable personal emergency radios are preferred over non-voice.

a) Pilots for all offshore helicopters, geophysical aircraft, and low flying survey or patrol aircraft should carry a PLB with voice capability in their flight clothing, vest or constant wear lifejacket.

b) Pilots in all categories, other than those listed above, are encouraged to carry a PLB.

c) Where Search & Rescue services are not readily available, companies may wish to consider the provision of PLBs to passengers.

d) PLBs should be 406 MHz capable so that the signal may be detected by the global SAR satellite system. In some areas, it might be advantageous for the PLB to also transmit on 121.5 MHz for homing reasons. Companies may need to confirm that the countries of operation are members of the COSPAS/SARSAT system.

4.2 Immersion suits for offshore helicopters and float planes

Immersion suits certified for use by the regulatory authority should be provided to crews and passengers for helicopter overwater operations in cold water hostile environments.

In the event that local regulations do not address the issue of wearing immersion suits, the requirements should be stipulated by the Member. These requirements should be subject to a risk assessment and a decision made prior to commencement of operations.

Several studies and regulatory documents providing information on estimated survival time based on water temperatures versus survival time in varying kinds of dress can be used as background material for making decisions on use of survival suits. Members should be able to access these documents through their respective Aviation Advisors.

4.2.1 Immersion suit considerations

A detailed risk assessment should be completed when determining if immersion suits should be worn.

Factors that should be considered in the analysis for immersion suits should include:

a) the water temperature

b) the availability and anticipated response time of SAR resources

c) realistic assumptions on search and/or rescue time, which should include:

   1) distance offshore

   2) worst-case visibility conditions

   3) accuracy of aircraft navigation equipment

   4) worst-case sea conditions

   5) time to hoist each occupant

   6) potential for assistance of occupants in the water

   7) dropping of survival equipment

   8) estimated survival time for clothing being worn

d) the worst case scenario in terms of the most unfavourable location of a ditched aircraft and longest mobilization times for aircraft or vessels, which should be used when detailing minimum response times

e) additional equipment and personnel factors such as, helicopter winching limitations, rescue helicopter capacity, crew expertise, guaranteed availability and all-weather capabilities of the rescue aircraft/vessels also need to be considered

f) determination by local management that occupants can be rescued within the prescribed survival time

g) compatibility of life-vests and rebreathing systems with immersion suits.

The following practical problems should also be considered.

- In certain areas, prevailing sea currents may result in water temperatures being sufficiently cold to make use of survival suits prudent, but high ambient air temperatures, combined with low air circulation within the suit can cause debilitating fatigue in crew members and discomfort for passengers.
- In such circumstances, efforts may be better directed at improving rescue response (vehicles, vessels or aircraft systems) and search capabilities rather than introducing survival suits.

Table 3: Recommended equipment for aeroplanes and helicopters

<table>
<tr><th>Recommended equipment</th><th>Multi-Engine 10 or more passengers</th><th>Multi-Engine 9 or fewer passengers</th><th>Single engine</th></tr>
<tr><td>Operated by two qualified crew</td><td rowspan="3">M</td><td rowspan="3">M [a]</td><td rowspan="3">VFR Day ops only, may be single pilot</td></tr>
<tr><td>IFR Certified</td></tr>
<tr><td>Autopilot or AFCS</td></tr>
<tr><td>2 primary Transceivers with 1 VHF minimum</td><td colspan="3" rowspan="5">M</td></tr>
<tr><td>Mode C or S Transponder</td></tr>
<tr><td>TSO C126 ELT</td></tr>
<tr><td>Passenger Briefing Cards</td></tr>
<tr><td>GPS (IFR TSO preferred, non IFR TSO is acceptable for Single Engine)</td></tr>
<tr><td>First Aid Kit</td><td colspan="3" rowspan="2">M</td></tr>
<tr><td>Fire Extinguisher</td></tr>
<tr><td>Satellite Tracking system or similar Member approved equipment</td><td colspan="3">R</td></tr>
<tr><td>Survival Equipment, appropriate for environment being flown (arctic, jungle, desert, sea)</td><td colspan="3">M</td></tr>
<tr><td>1 HF Transceiver</td><td colspan="3">M, if VHF is not assured for the entire area</td></tr>
<tr><td>1 ADF, 2 required if ADF is only navigation source</td><td colspan="2" rowspan="2">M [a]</td><td rowspan="2">O</td></tr>
<tr><td>2 VOR/ILS & 1 DME (where DME is avail.)</td></tr>
<tr><td>Radio Altimeter with audio/visual alert</td><td rowspan="2">M IFR and/or Offshore</td><td>MLT / Offshore</td><td>M Offshore & Pipeline survey</td></tr>
<tr><td>Weather Radar with colour screen</td><td>M [a]</td><td>O</td></tr>
<tr><td>Public Address / Intercom (PA) System</td><td colspan="2">M</td><td>M [b]</td></tr>
<tr><td>CVR and FDR</td><td colspan="2">M</td><td>O</td></tr>
<tr><td>Enhanced Ground Proximity Warning System (EGPWS/TAWS) [c]</td><td>M</td><td></td><td></td></tr>
<tr><td>Flight Data Monitoring (FDM/OFDM/HFDM/HOMP/FOQA) [c]</td><td colspan="3">RLT</td></tr>
<tr><td>Unit/Engine Monitoring System (UMS) [c]</td><td colspan="3">RLT</td></tr>
<tr><td>Upper Torso Restraints</td><td colspan="3">M for side facing seats / R for all other seats</td></tr>
<tr><td>Raft(s) [d]</td><td colspan="2">M Offshore, with 50% overload</td><td>Min 1 raft</td></tr>
<tr><td>Altitude Voice Alert Device (AVAD) [c]</td><td colspan="2">RLT</td><td rowspan="2">O</td></tr>
<tr><td>Emergency Exit Lighting System [c]</td><td colspan="2">M Offshore</td></tr>
</table>

Recommended equipment	Multi-Engine 10 or more passengers	Multi-Engine 9 or fewer passengers	Single engine
Underwater Locator Beacon sonar transmitter (Pinger)	M when CVR / FDR installed		
Medical Evacuation Kit Capability	O		
De-Icing Equipment	M for known, forecast or anticipated icing		
Collision Avoidance System TCAS – active interrogating only	RLT in High Density Area with no radar		
Heating for Cabin	M for temperatures below 15°C		
CO Detector in Cockpit (electronic)	M with fuel or shroud heaters		M Piston
Life jackets with attached signal devices and water activated lights.	M for Extended Overwater Flights		M wear for floatplanes and single pilots regardless of distance flown overwater.
High Visibility Pulse Lights [c]	RLT High traffic area		
HELICOPTER ONLY			
Instantaneous Vertical Speed Indicator (IVSI) [c]	M IFR and/or Offshore		M Offshore
Loud Hailer with externally mounted speaker	RLT	M single pilot / R	MLT
Health Usage Monitoring System (HUMS) [c]	RLT		
Airframe/Engine Vibration Monitoring System [c]			
Upper Torso Restraints, ALL seats [c]			
Mirrors for external situation awareness [c]	M		
External Mounted Life Rafts [c]	M offshore		
Aircraft Flotation Equipment			
Passenger life vests, constant wear [e]			
Pilot vest with voice capability Emergency Radio	M offshore and Remote areas		
Auto Inflation of Fuselage Floats [c]	RLT Offshore; MLT Offshore/R		
Approved Immersion Suits crew/passengers + EBS if required	M if required by CAA R if risk analysis justifies M for All appropriate for environment		
Radar-SART or AIS-SART	RLT Offshore		
Life Raft Emergency radio/ beacon /transponder	M offshore		
Emergency pop-out window [c]			
Litter Kit, Cargo Hook, Hoist, Aux. Fuel	O [f]		

Key

M = Minimum Requirement
LT = Long Term (one year or more) R = Recommended
N/R = Not Required O = Optional.
Where / is used, it is a divider between key letters or acronyms, except for N/R

a Optional when flown VFR.
b Should have a means of communication with passenger compartment.
c When an approved modification exists for the a/c type.
d Life rafts should be reversible or self-righting.
e Where TSO approved and available, life vests with crotch strap design preferred.
f Optional items are added based on role-specific mission requirements.

References

Only the current version of a reference should be used.

[1] ICAO. Annex 6 to the Convention on International Civil Aviation. Part I: *International Commercial Operations – Aeroplanes*. Part II: *International General Aviation*. Part III: *International Operations – Helicopters*.

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S5, *Specialized operations: Hoisting.*

[4] IHST HFDM Toolkit.

[5] UK CAP 693.

[6] FAA Advisory Circular AC 29-2C.

[7] EASA AMC & Guidance Material (GM) to Part-CAT.

[8] CAA CAP 753.

[9] HeliOffshore HUMS Best Practice Guidance

[10] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications and training.*

[11] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response.*

Version 1

590-S1
Specialized operations: Airborne geophysical

Purpose

The purpose of this module is to provide guidance on Airborne Geophysical Operations for both aeroplanes and helicopters.

Scope

This module of the Aircraft Management Guidelines (AMG) addresses airborne geophysical operations. It includes guidance on the need for risk assessments, aircraft equipment, crew experience, flight and duty times, survey heights and speeds, search and rescue, and fuel reserves and quality.

It applies to IOGP Members and operators performing airborne geophysical operations.

Contents: 590-S1

1 General

Geophysical survey flying is one of the most demanding flight regimes in which IOGP contracted aircraft operate.

To reflect the increase in difficulty of this type of flying, this guidance demands greater role experience and more stringent operational controls than those outlined in the standard conditions for aeroplanes and helicopters.

2 Membership of IAGSA

See the *IAGSA Safety Manual* [1] for recommended practices for airborne geophysical survey operations.

IOGP strongly encourages all operators engaged in geophysical flying operations to become members of the International Airborne Geophysics Safety Association (IAGSA).

The charter of IAGSA includes the promotion of safer operating practices and an open forum for discussion within the airborne geophysical industry.

Members should require compliance with IAGSA's standards and IOGP recommended practices by any operator contracted for geophysical survey flying.

Membership of IAGSA allows access to the organization's Safety Manual.

3 Risk assessment

A risk assessment should be carried out by the aircraft operator prior to the commencement of any geophysical survey for a Member. The assessment should provide an insight to all perceived areas of risk. It should determine satisfactory performance margins related to the topographical area of operations as well as the minimum speeds and heights to be used.

IAGSA provides a comprehensive risk assessment tool specifically for geophysical survey purposes, the successful completion of which would satisfy the IOGP requirements in this respect.

4 Aircraft Equipment Standards

See AMG 590-G, *Recommended aircraft and personal equipment* [2] for a list of recommended equipment to be fitted to various types of aircraft.

All non-standard modifications to the aircraft should be certified by the relevant aviation regulatory authority and be acceptable to the Member's Aviation Advisor.

In addition to the items listed in [2], the aircraft should possess the following serviceable equipment:

a) head up track and height guidance

b) clear, unscratched and serviceable canopy/windows

c) appropriate securing mechanism for any additional instrumentation.

5 Personal equipment standards

See AMG 590-G, *Recommended aircraft and personal equipment* [2] for a list of a detailed list of recommended personal equipment to be carried), including 3.3.1 for life jackets, 3.3.2 for Emergency Breathing Systems, 4.1 for ELT, PLB, etc. and 4.2 for immersion suits.

All occupants of an aircraft conducting geophysical flying should wear appropriate clothing, including:

a) flying helmet meeting industry safety standards

b) non-synthetic or fire blocked/retardant trousers and shirt

c) cotton undergarments

d) robust footwear

e) life jackets if required by regulation

f) immersion suits if the RA determines they are necessary

g) Personal Locator Beacon (PLB).

6 Minimum crew

A pilot and geophysical operator is the minimum acceptable crew for airborne geophysical surveys. Single crew operations (i.e. the pilot as the sole occupant) should not take place unless the survey equipment can be operated automatically without significant inputs from the pilot during flight.

7 General pilot experience

The experience requirements shown in 7.1 and 7.2, below apply to all aircraft operations irrespective of Maximum All Up Weight (MAUW).

Each requirement should be satisfied in addition to the specific pilot experience requirements detailed in Table 1 to 3 of AMG 590-C, *Personnel qualifications, experience and training* [3].

7.1 Pilot in Command

Successful completion of a geophysical training programme including, where applicable, a mountain flying course:

a) 300 hours experience in airborne geophysical operations, including 100 hours in Command or Pilot In Command Under Supervision (PICUS)

b) 50 hours Command (or PICUS) on geophysical survey in the contract aircraft type

c) 10 hours Command (or PICUS) in the contract aircraft type conducting geophysical operations within the preceding 90 days, or successful completion of a geophysical line check of at least two hours (excluding ferry time) within the preceding 90 days.

7.2 Co-pilot

Successful completion of geophysical training programme including, where applicable, a mountain flying course, and 10 hours on low level survey operations.

Manipulation of the flight controls at survey height by a co-pilot should be restricted to those flights where the aircraft captain is an approved check and training or supervisory captain.

8 Pilot flight and duty times

Due to the fatiguing nature of geophysical flying, the flight hour limitations shown in 8.1 and 8.2, below should be observed. In addition to these requirements, aircraft crews operating internationally should comply with the flight and duty limitations of the country in which they are operating if so required by the NAA.

8.1 Single pilot operations

- 5 hours per day on actual survey (transit time excluded)
- 34 hours in any consecutive 7 days (inclusive of transit time)
- Overall 28 day limits – 100 hours as specified in 1.6.3 (Maximum flight times) of AMG 590-D, *Aircraft operations* [4]
- A minimum of 24 consecutive hours free of duty during any seven consecutive days.

8.2 Two pilot operations

- 7 hours per day on actual survey (transit time excluded)
- 34 hours in any consecutive 7 days (inclusive of transit time)
- Overall 28 day limits – 120 hours as specified in 1.6.3 (Maximum flight times) of AMG 590-D, *Aircraft operations* [4]
- A minimum of 24 consecutive hours free of duty during any seven consecutive days.

9 Minimum survey height

IOGP recommends that the IAGSA guidance, below, should be followed:

The maximum clearance height possible should be specified consistent with the objectives of the survey to be flown. If a survey is to be conducted at less than 100 m (328 ft) above ground level (agl), it should only be flown after carrying out a detailed RA as discussed in section 3 (Risk assessment) considering, but not limited to:

a) terrain relief and vegetation

b) aircraft type

c) aircrew flight and duty times

d) prevailing weather conditions

e) anticipated density altitude

f) pilot experience and recency

g) planned flight speed.

10 Minimum survey speed

For each aeroplane type, the minimum safe survey speed is calculated to be the greater of:

a) 130% of clean stall speed (Vs)

b) 110% of best single-engine rate of climb speed (Vyse, if applicable), and

c) minimum safe single-engine speed (Vsse, if published).

This minimum survey speed should be observed even after 'zoom' climbs and should be raised as necessary to account for local conditions such as turbulence and gusty winds.

11 Minimum fuel reserves

Refer to chapter 4 of ICAO Annex 6, Section II [5] for detailed requirements of the fuel reserves to be carried under different circumstances.

Where the local regulatory authority requires higher reserves they should be used.

12 Fuel Quality and procedures

It is firmly established that a very high level of fuel quality control is essential.

Members should refer to the guidance in sections 11 to 14 of AMG 590-F, *Airfields, heliports, helidecks and facilities* [6], which provides guidance on fuel installations, quality control and drum stock.

13 Emergency Response and Search and Rescue

For the requirements of Emergency Response and Search and Rescue, see AMG 590-B, *Safety Management Systems, Quality Assurance and Emergency Response* [7].

References

Only the current version of a reference should be used.

[1] IAGSA Safety Manual. Only available to IAGSA members.

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training*.

[4] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[5] ICAO. Part II: *International General Aviation.*

[6] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-F, *Airfields, heliports, helidecks and facilities.*

[7] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management Systems, Quality Assurance and Emergency Response.*

590-S2
Specialized operations: Aerial pipeline inspections

Scope

In most countries, periodic inspections of product pipelines are a requirement of national legislation, although the owner will usually wish to carry out inspections regardless of legislation.

As well as checking for any signs of a leak from or damage to a pipeline, the inspection is to check that there is no danger to the integrity of the line from nearby construction or drainage work. The use of Rotary Wing (RW) or Fixed-Wing (FW) aircraft is often the most effective way of achieving the task.

Additional hazards are introduced by the need to operate at an altitude which is lower than optimum for normal operations. These hazards can be managed by complying with the following guidance.

See also

http://www.hsac.org/portals/45/rp/Air Observer_RP2009_1.pdf

http://www.hsac.org/portals/45/rp/Patrol CaptAORP3.pdf

http://www.hsac.org/portals/45/rp/EquipAORP2.pdf

http://www.hsac.org/portals/45/rp/MaintAORP1.pdf

http://www.hsac.org/portals/45/rp/AORP0801.pdf

http://www.hsac.org/portals/45/rp/RP2010_3New.pdf

Contents: 590-S2

1 Weather

All aerial survey/pipeline patrol operations should normally be conducted under Day Visual Flight Rules (VFR) conditions as detailed in 1.7 (Aviation weather guidance) of AMG 590-D, *Aircraft operations* [1].

Operations should be conducted at no less than the minimum safe altitude stipulated by regulation or authorized by the NAA.

Helicopters, when used, should not be operated within the avoid area of the height/velocity curve, as published in the helicopter's approved flight manual.

2 Single-engine aircraft

If single-engine operations are considered the conditions specified in 1.2 (Single-engine airplanes) of AMG 590-D, *Aircraft operations* [1] should be met.

In addition, flights should be conducted at not less than 500 feet AGL cruising altitude and at a speed and height combination such that, in the event of a power failure, a safe forced landing can be made.

An altitude exception is made where an appropriate approved low level waiver is in place and the pilot has read and signed the waiver which is carried in the aircraft.

3 Aircraft configuration

For long-term pipeline patrol operations, in addition to the requirements listed in AMG 590-G, *Recommended aircraft and personal equipment* [2], the aircraft should be at a minimum equipped as follows:

a) equipped for IFR flight

b) GPS (IFR TSO preferred)

c) Mode C or Mode S transponder (or equivalent)

d) TAWS or Radar Altimeter with audio and visual alert or Automatic Voice Alerting Device (AVAD) where available for the aircraft model to ensure that the selected height AGL is maintained

e) automated engine monitoring systems for all single-engine aircraft

f) Landing lights converted to pulse light configuration (for FW tip pulse lights) in high-density areas

g) climate-controlled cabin for all operations in temperatures below 15°C and for long-term operations where temperatures are routinely above 32°C

h) a high visibility paint scheme with appropriate markings and the operator High Visibility Blades for helicopters if approved for the model

i) First Aid kit and fire extinguisher

j) Upper Torso Restraint if an approved modification for the aircraft exists

k) Carbon Monoxide Detector in the cockpit (visual or electronic) on piston aircraft

l) Real Time Satellite Flight Following System

m) Wire Strike equipment for helicopters

n) FDM appropriate to type and mission.

4 General Pilot and/or observer requirements

Flight operations should meet the guidance in 1.5.2 (Single pilot operations) of AMG 590-D, *Aircraft operations* [1], and sterile cockpits etc. as detailed in 3.1 (Operator procedures) of reference [1].

Annual Aircrew Decision Making (ADM)/CRM Training should be completed by all crewmembers.

Pilots and Observers should wear eye protection against Bird Strikes whilst operating at Patrol Level.

5 Pipeline patrol specific pilot role experience

In addition to experience requirements contained in Table 1, the following are recommended for all aircrew:

a) successful completion of a pipeline route check for the route to be flown (unless for a newly established route)

b) basic instrument experience

c) 50 hours in command patrol survey time in the previous six months

d) 10 hours on the contract aircraft type conducting pipeline operations within the preceding 90 days, or successful completion of a pipeline line check within the preceding 90 days

e) enrolled in an operator approved drug and alcohol programme if allowed by local regulations

f) for helicopter operations, see helicopter recent role experience in AMG 590-C, *Personnel qualifications, experience and training* [3], Table 2 (Aircraft Commander experience requirements).

Table 1: Pipeline patrol specific observer role experience

Requirements	PIC
Airman Certificates & Ratings	
Commercial Pilot Certificate	Minimum
Instrument Rating or an Airline Transport Pilot Certificate	
Appropriate Category Rating	
Appropriate Class Rating	
Valid Second Class Medical Certificate	
Flight Time[2]	
1500 Hours Total Flight Time	Minimum
500 Hours Cross Country Flight Time	
25 Hours of Night Flight	
25 Hours in Make and Model	
50 Hours Aerial Patrol Experience	
Programmes	
DOT Operator Qualification Program Completed (If applicable)	Minimum
Enrolled in operator approved Drug & Alcohol Program	
Training	
Annual Recurrent Flight Training[1]	Minimum
Annual Recurrent Ground Training and Testing	
Annual ADM/CRM Training	
IIMC/Emergency Training	
Annual Maintenance Training	
Annual Flight/Line Check[1]	
Annual Simulator/IFR Training	Highly Recommended

1) Six months between Recurrent Flight Training and Flight / Line Check
2) Predicated on single engine airplane for Aerial Observation

The following additional recommendations are for all aircrew:

a) successful completion of a pipeline observer training programme

b) enrolled in an operator-approved Drug & Alcohol programme.

6 Pilot flight and duty time

The pilot flight and duty time limitations described in 1.6 (Flight and duty times) of AMG 590-D, *Aircraft operations* [1] should be applied.

7 Collision avoidance

There is an increased likelihood of traffic confliction with military low-level traffic; power line inspection flights; aerial work and private flying activity, often beneath ATC radio coverage.

The following measures have been shown to alleviate the hazards:

a) ACAS equipment as described in section 3 (Aircraft configuration).

b) An optimum operating height should be maintained at 500 feet AGL or higher. An exception is granted when an appropriate low level waiver is in place and the pilot has read and signed the waiver which is carried in the aircraft.

c) Every effort must be made to coordinate with other airspace users through a notification system.

Transponders should always be turned on even if operating outside controlled airspace or in remote areas. Other aircraft which may be operating in the low level environment are typically equipped with collision avoidance equipment that relies on detecting transponder signals from potentially conflicting aircraft.

8 Passengers – Crew Members

Passengers should normally not be carried during aerial surveillance operations, unless they are performing work related to the flight. In such cases, they should be considered 'crew members', if not in contravention to local regulations.

In addition to a normal passenger briefing described in 2.5.3 (Minimum briefing requirements) of AMG 590-D, *Aircraft operations* [1], persons acting as crew members will be briefed on their responsibilities by the pilot to include:

a) primary responsibility of the crewmember is to act as an observer

b) route of flight

c) map briefing pointing out all known hazards

d) Weather en route and at destination

e) altitudes

f) emergency procedures

g) other duty assigned by the PIC.

The decision to operate using an observer in addition to a single pilot should be determined by the pipeline company based on a formal risk assessment. The aircraft operator should be consulted for input during the risk assessment process.

Factors that need to be taken into account when performing a risk assessment include whether the operating area is considered hostile or non-hostile, the availability of Search & Rescue, aircraft traffic, urban areas, and the availability of real time flight following.

An observer should be used if there exists a significant risk to the operation based on the results of the risk assessment. These observers should receive appropriate initial and recurrent training following a written curriculum with appropriate testing. Recommended subjects include duties, responsibilities, observation techniques, and radio procedures.

9 Exemptions/Low altitude waivers

In most countries, pipeline inspections occur below normal minimum operating altitudes, especially in the case of helicopters, and it will be necessary for the operator to obtain an exemption from the regulatory authority to conduct low-level operations.

If exemptions are not in place, the client and operator may be subject to liability in the event of an accident or complaint regarding aircraft noise.

10 Inadvertent entry into Instrument Meteorological Conditions

Pilots might have limited experience in flying under IFR. It is therefore recommended, where allowed by local authority, that procedures following inadvertent cloud entry should be included in the Operations Manual and practiced during pilots' base checks.

11 Flight Following

See 3.2 (Flight Following) of AMG 590-D, *Aircraft operations* [1].

12 Flights over urban areas

Pipelines running through urban areas should, wherever possible, be inspected from the ground.

Where aerial inspection is essential, it should be conducted at a minimum altitude approved by the NAA.

When operating single-engine aircraft, or multi-engine aircraft unable to sustain flight on one engine, pilots will select a flight path that provides a safe emergency landing area, avoids damage to third parties or facilities on the ground and that provides an opportunity for a safe emergency landing. Operators will designate the preferred flight-path to be used if flights are conducted routinely over the same congested area.

Landings and low-altitude inspections en route (Helicopters only).

During the flight, the observer will take a note of construction work or any other activity near the pipeline which could affect its integrity, and will report events to the pipeline owner to follow up on the ground. However, if the observer judges that urgent action is required (for example, a trench converging on the pipeline), the observer may request the pilot to land nearby so that he can talk to persons on-site.

The operator should therefore have a section in their Operations Manual for unplanned landings or low altitude inspections to include guidance on the justification for such a landing, landing site selection, informing base or ATC of the intention to land, and recording the event. Pilot training and line-checking should include unplanned landing procedures.

13 Minimum fuel reserves

Refer to chapter 4 of ICAO, Annex 6 to the Convention on International Civil Aviation, Part II: *International General Aviation* [3] for detailed requirements of the fuel to be carried under different circumstances.

Where the local regulatory authority requires higher reserves, they should be used.

14 Fuel quality and procedures

It is firmly established that a very high level of fuel quality control is essential.

Members should refer to the guidance in sections 11 to 14 of AMG 590-F, *Airfields, heliports, helidecks and facilities* [4], which provides guidance on fuel installations, quality control and drum stock.

15 Emergency Response and Search and Rescue

For the requirements of Emergency Response and Search and Rescue, see AMG 590-B, *Safety Management System, Quality and Emergency Response* [5].

References

Only the current version of a reference should be used.

[1] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[3] IOGP. Report 590. *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[4] ICAO. Annex 6 to the Convention on International Civil Aviation. Part II: *International General Aviation*.

[5] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-F, *Airfields, heliports, helidecks and facilities.*

[6] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response.*

Version 1

590-S3
Specialized operations: Cold weather operations

Purpose

The purpose of this module is to provide guidance to IOGP Members on the operation of aircraft in cold weather conditions.

Scope

This module of the AMG contains information on the operation of aircraft in cold weather conditions. It provides information for personnel, aircraft and maintenance uses.

It is applicable to aviation providers and IOGP Members operating in cold weather conditions.

Contents: 590-S3

1 Introduction and application

The guidelines in this section apply to aviation operations conducted in cold climates globally and are not limited to Arctic regions. These guidelines also apply to operations conducted where the classification of risk is considered as operating within a hostile environment based on the temperature and associated hazards such as mountainous terrain, glaciated areas and broken sea ice as well as time to rescue response.

For determination of a hostile environment, see 1.7.2.2 of AMG 590-D, *Aircraft operations* [1].

Application of the cold weather operating guidelines of this section is not based solely on a specific temperature or geographical region. The Aviation Advisor, in consultation with the business unit, should determine the requirements of the proposed mission and the applicability of these guidelines.

It is not practical for these guidelines to cover every cold weather scenario. The Aviation Advisor should analyse all of the factors to complete a safe operation. Environmental effects, geographical location and duration of the mission should be considered in the selection of the aircraft, support equipment and personnel.

For cold weather operations, the operator should have procedures in their operations manual that address the subject and are approved by the NAA. Additional authorizations regarding cold weather operations may be present in the operator's Operating Specifications (attached to the Operating Certificate). The operator should have identified the hazards associated with cold weather operations, listed them in their hazard register and documented and put in place the appropriate controls.

This module provides supplementary guidance not contained elsewhere in the AMG and is designed to be used in conjunction with the full contents of the AMG. References are shown where applicable.

2 Equipment and materials

Aviation operations in high latitudes and extremely low temperatures are significantly affected by a number of factors which are briefly discussed below.

Effects of cold on equipment and materials are numerous. Some examples are:

a) Metals become more brittle – leading to greater risk of cracking and fatigue damage.

b) Shrinkage in metal components built to close tolerances, especially with dissimilar metals, can result in stiffness of controls, jamming of panel doors or other effects.

c) Hydraulic oil seals can harden, resulting in leakage.

d) Reduction gear oil seals could harden, causing the loss of oil and potential loss of pressure.

e) Pneumatic lines can clog with frozen condensation, which could affect the operation of pneumatically operated systems.

f) Fuel could start to congeal, ice crystals can form within the fuel system, and fuel filters can become blocked or by-passed with the use of some fuel additives. Special fuels might be required.

g) Flight control take off position indicator sensors can malfunction. There might also be effects on electrical trim motors resulting in slow trim rates or trim motor cut-out due to torque overload induced by stiffness of the controls.

h) Lubricants can harden, resulting in stiff mechanical engine and flight controls.

i) Vertical suction gyro systems are very slow in erecting during low temperatures. (At –10°C, it takes 4 minutes, while at –40°C, it takes about 8 minutes.)

j) In high latitudes, navigation and communication equipment might also be affected in the following manner:
   - high magnetic variation – unreliability of gyro-magnetic compasses
   - poor coverage/footprint of some communication satellites
   - solar flare effects can affect some communications.

Instrument, electrical and avionic factors to consider:

k) battery performance might be markedly reduced

l) sluggish motor and actuator movements

m) sluggish antenna scan – radar

n) wires become brittle in extreme cold and are easy to break

o) possible lack of engine and/or trim and navigational indications until units have properly warmed

p) on/off and volume controls hard to turn, or inoperative

q) gyros might take longer to erect (horizontal and vertical)

r) cockpit indicator lights might be dim due to poor contacts

s) indicator glasses might fog in units not hermetically sealed

t) LCD performance might be affected

u) contraction of avionics mounting racks is possible, causing multiple or intermittent malfunctions in avionics/instrument systems

v) cold engines require more starter torque and higher current drain

w) the avionics might require warm-up after cold soak. Over twenty minutes might be required at temperatures below –30°C. (Refer to manufacturer's operating limitations for individual equipment.) The following indications may confirm proper warm-up:
   - frequency/code displays illuminate normally with pilot control of brightness and frequency selection
   - audio reception is available on all applicable avionics.

3 Personnel

Personnel working in a cold weather environment might also be affected by a range of factors such as:

a) projected survival times in Search & Rescue scenarios

b) the risks of hypothermia and frostbite

c) over dressing, causing heat distress

d) reduced dexterity, co-ordination and decision making ability

e) the potential for cold burns when handling metal or volatile fluids

f) diet – the need to increase calorie intake, risk of dehydration and avoidance of alcohol and caffeine

g) time to carry out tasks when outside is increased due to bulky clothing, possible difficulties in moving equipment, a need to take more breaks in order to stay warm, etc.

h) potential snow blindness and sunburn

i) psychological effects of working in high latitudes (e.g. Seasonal Affective Disorder)

j) physiological effects of working at high altitudes.

4 Environment

Cold weather can have a profound effect on the ability to conduct aviation operations, especially when rapid changes are likely to occur.

Factors to consider could be:

a) accumulations of snow and ice (wet snow, rain ice, clear icing, rime ice and hoar frost) on the airframe, including:
   - degradation of the aerodynamic properties of wings, rotor blades and control surfaces
   - asymmetric weight distribution on helicopter rotor blades causing vibration
   - control restrictions
   - poor cockpit visibility
   - possible foreign object damage to engines

b) falling and blowing snow affecting visibility

c) snow clearance requirements on airfields and helipads/helidecks

d) increased risk of controlled flight into terrain (CFIT) due to whiteout or flat light conditions

e) contaminated runways, helipads/helidecks

f) sea ice – pressure ridges, moving rubble ice affecting search & rescue

g) ice fog, arctic sea smoke

h) static electrical discharges are routine and of increased intensity in dry conditions

i) visual illusions caused by low sun, flat light, etc.

j) high winds.

5 Remote cold weather operations

Operations taking place in remote areas might incur greater travelling distances. The lack of facilities can also be a problem in many areas.

Consideration should be given to the availability of:

a) accurate and timely weather forecasts/observations

b) alternates for IFR operations

c) fuel and maintenance facilities

d) hangars, particularly for long term operations

e) Search & Rescue assets and medical facilities

f) navigational aids

g) reliable communication systems

h) wildlife or other obstructions on the landing area

i) needs of the indigenous population, if applicable

j) instrument approach systems including GPS and DGPS.

6 Aircraft certification standards and equipment fit

6.1 General

The Member's Aviation Advisor should assist the company in determining the appropriate aircraft to support the operation. As a recommendation, aircraft should be certified to at least –40°C.

The Member should work closely with the operator to ensure the aircraft is fitted with and supported by appropriate and approved cold weather operating equipment, including de-icing, anti-icing and ice detection devices.

Modification kits are available for some aircraft models to improve cold weather limitations. These should have a Supplemental Type Certificate (STC) and be approved by the NAA and the manufacturer.

Basic and supplemental cold weather information is typically available within aircraft flight manuals.

6.2 Aircraft equipment

See AMG 590-G, *Recommended aircraft and personal equipment* [2] for the equipment fit to an aircraft for normal operations, but not cold weather.

Aircraft role and location-specific additional equipment considerations may also include:

a) particle separators or intake screens may need removal or modification during cold weather operations

b) engine and airframe anti-icing systems

c) snow shoes/skis for landing gear. Specialized skis are available for use on small aeroplanes and most helicopters with skids or wheels. It may be appropriate to use these for landings in unimproved snow areas as well as, in warmer months, in soft tundra/muskeg

d) low precession compasses with a 'direct gyro' mode for operations in high latitudes

e) GPS (This should be a duplex system if cleared for use as the primary navigation aid.) The use of differential GPS (DGPS) and/or Wide Area Augmentation System (WAAS) or equivalent systems should also be considered

f) inertial navigation systems (INS)

g) satellite flight following systems

h) enhanced night vision equipment, including night vision goggles (NVG), heads up displays (HUD), and enhanced vision systems (EVS)

i) EGPWS to mitigate the CFIT hazards associated with white-out and flat light.

6.3 Additional maintenance-related modifications

Any manufacturer's cold-weather modifications should be considered and installed or made available as necessary.

The following additional equipment should be considered for all aircraft:

a) screens/covers to protect cockpit windows

b) baffles and intake covers

c) preheating modifications for cabins, engines, electronic bays, transmissions, etc.

d) wing or rotor blade covers

e) wing or rotor blade tie downs.

7 Flight operations – General

7.1 Aircrew experience and Qualifications

In accordance with Table 1 (Aircraft Commander and Co-Pilot qualifications) of AMG 590-C, *Personnel qualifications, experience and training* [3], all pilots operating in cold weather environments should have at least one year's experience in the conditions and be IFR current.

Additional training requirements are listed in 13.2 (Training).

7.2 Weather

When operating in cold climates and hostile environments the operator should have accurate weather forecasting equipment as well as equipment at the operational base that monitors changes in barometric pressure. It is advisable to have a certified meteorologist on site.

7.2.1 Equipment and training

See section 4 (Weather monitoring systems) of AMG 590-F, *Airfields, heliports, helidecks and facilities* [4] for information on recommended meteorological equipment, observation requirements, maintenance and use of trained personnel.

Consideration should be given to providing the following special meteorological equipment:

a) Reference Thermometers that can record below –40°C

b) Barometric altimeters with adjustments for extremely low pressure.

7.2.2 Weather planning

The following points should be considered when weather planning:

a) Section 1.7 (Aviation weather guidance) of AMG 590-D, *Aircraft operations* [1] provides details on operational weather guidelines, adverse weather planning, etc.

b) An accurate weather forecast is a critically-important requirement, especially in seasons and locations where the weather is known to change rapidly. Consideration should be given to provision of an in-house capability if no reliable service is available locally.

c) Weather reports and icing forecasts should be used with caution. Area forecasts will probably not give sufficient detail when operating in remote locations. Furthermore, current definitions used to describe the icing environment (trace, light, moderate, and severe) do not differentiate with respect to different types of aircraft. A particular liquid water content and drop size distribution may be light with respect to one aircraft and moderate to another.

d) Cloud base and visibility minima for VFR flight, should take account of terrain and problems of depth perception associated with flat light.

The published Adverse Weather Policy should include guidelines for the following in addition to those already provided in reference [1].

a) minimum operating temperatures for aircraft

b) minimum operating temperatures for personnel working outside without portable heating devices

c) preheating temperatures

d) cold weather flight control hydraulic warm up procedures

e) compacted snow or ice operations

f) temporary airbases and landing site safety

g) inclusion of additional crew members, in particular maintenance staff

h) landing zone condition (icy, deep snow, powder snow).

7.3 Flight Following

See 3.2 of AMG 590-D, *Aircraft operations* [1] for information on Flight Following.

Any flight following system should be permanently monitored when aircraft are airborne and recording equipment should be provided.

7.4 De-ice and anti-ice – Aircrew responsibilities

Preflight de-icing of aircraft and removal of snow is critical to operational safety. Aircraft unsheltered by hangars are subject to frost, snow, freezing drizzle and rain that can cause icing of control surfaces, rotor blades and fuselages, rendering them unusable until cleaned.

Operators should take particular care to ensure that aircraft are free from snow and ice during preflight inspections. It should never be assumed that snow will blow off, and there could be a layer of ice underneath it. Neither should the effect of even a thin layer of ice on wing surfaces be underestimated. Data from the available literature suggests that ice roughness as small as 0.010 – 0.015 inches (0.254 mm – 0.381 mm) can negate take off stall margins altogether on commuter type aircraft.

If any accumulation is present, the aircraft should be de-/anti-iced. Operators' operations and training manuals should include aircrew actions to be followed for de-/anti-icing which include the following and should be type specific to the aircraft model being used:

a) Examination of the aircraft surfaces for contamination should be completed within five minutes prior to take off

b) Aircrew responsibilities for the clean aircraft rule including which surfaces should be checked

c) During blowing snow conditions, crew should inspect and clear any openings (engine or heater intakes, pitot static openings, wheel wells, fuel vents, elevator and rudder controls, control tubes, etc.) for snow/ice obstruction that could affect normal operations

d) Recognition of surface contamination

e) Aircrew training on the de-/anti-icing procedures, holdover time tables (if operator has approval to use holdover times) and responsibilities

f) De-/anti-icing procedures, fluids, and methods authorized for use

g) Verification from the ground crew that the de-icing has been completed and of the holdover time start if the operator has an approved de-icing programme

h) Location specific procedures and equipment

i) Post de-/anti-icing checks.

See 10.7 (Maintenance – De-ice/Anti-ice) for details on de-ice/anti-ice procedures.

7.5 Refuelling with passengers on board

Refuelling with passengers on board an aircraft is hazardous. However, at remote sites in cold weather, it might be safer to refuel with passengers on board if no warm accommodation exists.

See 2.12 (Rotors running refuelling (RRRF)/Helicopter rapid refuelling) of AMG 590-D, *Aircraft operations* [1] for detailed guidance on procedures.

7.6 Sea ice operations

Operations on or from sea ice are particularly hazardous and require specialized experience and knowledge. Only operators with such experience and who are familiar in the region of interest should be employed in such work.

When operating on sea ice:

a) A very simple formula to estimate the minimum ice thickness required to support the weight of the aircraft as flown is $h = 4 \times$ square root of P; where h is the ice thickness in inches and P is the load, or gross weight, in tons. It should be noted that this is an extremely basic calculation and should be taken as an absolute minimum thickness required.

b) Freshwater ice and sea ice have different physical properties. The former is stronger but more brittle and prone to sudden collapse. Sea ice will bend and is more flexible.

c) A crucial point, particularly when considering fixed-wing operations is the water depth. Moving over ice will create a shock wave beneath. As the depth shallows, this can cause an interference wave that builds up beneath the ice and crack what would otherwise be considered strong enough ice. This is relevant to river and lake landings and sea ice close to shore.

d) Prior to any aircraft operations ice should be drilled to assess its thickness and the operation reviewed by a risk assessment. This is clearly problematic if landing for the first time at an unmanned site. With helicopters, it might be possible to drop a drill crew then hold off and land on satisfactory result. Alternatively, it might be necessary to send a crew in via ground means or land at a nearby hard surface area.

8 Helicopter specific operations

8.1 Blowing snow and whiteouts

Blowing snow and whiteouts can pose extreme hazards to helicopter operations due to loss of visual cueing and reference to the horizon, and pilots should have training in actual conditions before performing these operations.

It is vital that landing areas be cleared of loose snow as far as possible.

The addition of landing cues that extend above the snow level outside the perimeter of the established landing area should be considered, as should the provision of a portable Visual Approach Slope Indicator (VASI) or Precision Approach Path Indicator (PAPI).

8.2 Remote landing areas

When operating in deep, dry snow conditions which may obscure vision during the descent, pilots should be trained to recognize and avoid possible white out conditions. A pilot should not descend in snow conditions which would obscure visual references.

8.3 External loads

Very long lines might be necessary to allow the helicopter to hover above the snow cloud developed from the rotor wash.

Specialized training in actual conditions should be carried out.

Ground crew should be issued with additional protective clothing due to wind chill effects.

8.4 General procedures for Aircrew preflight and in-flight ice encounter

Whenever there is potential for flight in icing conditions, pilots should consider the following:

a) Avoid all icing conditions. When unexpected icing is encountered in flight, pilots should leave the icing environment as quickly as possible consistent with safe flight.

b) Avoid abrupt or erratic cyclic and collective inputs when attempting to shed rotor blade ice accumulations, since such inputs can cause asymmetrical shedding and accompanying severe vibrations. Rapid variations in rotor RPM might be of some assistance in achieving symmetrical shedding.

c) For light helicopters, the limited power available and faster rotor systems make these aircraft extremely sensitive to in-flight icing (severe vibrations, control difficulties and insufficient power reserves).

d) Not to attempt to judge or estimate main rotor blade ice accumulations by the observed build up on the windscreen or other areas of the aircraft. Since ice accumulates on the rotor blades at an accelerated rate, a 5 – 10 per cent increase in power required to sustain normal flight or a decrease in airspeed of 10 – 30 kts for a given power setting is a more reliable method of determining in-flight icing.

e) After flight in the icing environment, helicopters should be shut down in a position that avoids ice being shed off main and tail rotors injuring personnel or damaging other aircraft or structures.

f) If unintentional entry into IFR conditions occurs, be aware that sustained flight in the upper half of cumulus and stratus clouds, where large water droplets and high liquid water content are normally found, may cause an extremely fast build-up of ice with resulting severe vibrations.

g) When severe vibrations due to blade icing occurs, reduce airspeed from normal cruise to lessen the effects.

9 Aeroplane specific operations

9.1 Taxiing

During taxiing, the following points should be considered:

a) reduced visibility due to snow cloud caused by prop wash

b) in snow or slush conditions, avoid taxiing at high speed or long distances as contamination may accumulate in the wheels, bay doors, brake housings, etc.

c) after taxiing in slush, it is recommended that the landing gear is cycled several times shortly after takeoff to dislodge any debris before it freezes and affects the operation of doors and actuators

d) for aircraft with non-retractable landing gear, it is recommended that wheel skirts be removed during winter operations

e) during taxiing, use brakes to create friction heat

f) taxi with slats/flaps retracted to avoid ice and/or slush build up on rails, tracks, and actuators

g) follow manufacturer's recommendations for use of parking brake and control locks.

9.2 Float and amphibious aeroplanes

Aeroplanes with floats can have water rudders and landing gear freeze after departure from water in cold weather. Therefore, amphibious float planes should not conduct water landings when air temperatures are below 0°C.

9.3 Ski-equipped aeroplanes

9.3.1 Preflight checks

Due to lack of brakes, it is not normally possible to carry out propeller auto-feather and overspeed governor checks on snow surfaces. However, the opportunity to make these checks should be taken when the skis are frozen in.

When carrying out these checks, it is most important that the area ahead of the aircraft is free of all obstructions in case the aircraft should move forward.

9.3.2 Take offs – Additional considerations

The consistency of snow covered surfaces can vary greatly between sites and over time. The snow may be hard, almost icy, soft powder or melting slush with the consistency of porridge. The softer conditions can reduce aircraft acceleration to the point where it is impossible to get airborne.

To address this, taxiing along the take off run several times to compact the surface has been shown to be effective. In addition, when loading the aircraft, the centre of gravity should be positioned as far aft as possible within manufacturer's loading limits. This will aid the lifting of the nose ski, reduce drag and further acceleration.

Sastrugi patterns can also influence take off direction. Take offs parallel to sastrugi will reduce shock loads through the nose gear, but all factors should be considered.

9.3.3 Taxiing and parking

Prior to parking the aircraft for any length of time, it is useful to stop for a few seconds before moving on to the parking area; this allows the skis to cool and helps prevent them subsequently freezing to the surface.

The parking area should be approached with extreme caution, especially when there are obstructions close at hand. The lack of instantaneous braking, and the possibility of the aircraft sliding (even when the engines are stopped) should be borne in mind at all times by the crew and ground personnel.

Ideally the aircraft should be parked into wind. If on a transverse slope, park across the slope, with the nose ski turned slightly uphill.

A fully loaded aircraft might not slide when stationary, but might do so as weight is removed.

On some surfaces and slopes, forward movement can occur even at idle power and with propellers feathered.

9.3.4 Ice airstrip operations

Ice strip construction and operations are specialised undertakings, and professional advice should be sought if the mission requires an ice strip. The aircraft operator should have approval from their controlling NAA to operate from such airstrips, and the aircraft should be equipped for gravel, or contaminated runway operations prior to use.

10 Maintenance procedures

10.1 General

The following points should be considered when developing maintenance procedures for cold weather operations:

a) Aircraft should be maintained in accordance with any enhanced procedures recommended by the manufacturer for operations in cold climates.

b) Pitot static systems can become blocked by ice, snow or de-ice fluids.

c) To reduce condensation in fuel tanks, when operationally possible for the next flight, it is recommended that the tanks be filled as much as practicable before placing in hangars or when parking warm aircraft in cold conditions.

d) Compared with normal conditions, cold temperatures significantly increase fuel density, raising the ratio of weight to volume.

e) Research into applicable maintenance publications (airframe and engine maintenance manuals, service bulletins and ancillary equipment) should be undertaken to determine if any systems or components require additional precautions during cold weather operations.

f) The freezing point of liquids in galleys, toilets and potable water systems should be considered. If aircraft will be cold soaked below freezing temperatures, such liquids should be drained down and the relevant systems disabled.

g) Tyres might appear to have low pressure in cold weather. The minimum required inflation should be maintained for the cooler climate and readjusted on return to the warmer climate.

h) Landing gear oleo struts should be serviced with nitrogen as per manufacturer recommendations to prevent the formation of ice crystals in the hydraulic fluid that could cut the seals.

i) Engine fire protection canisters might appear below normal charge. The appropriate charge should be determined by the use of a calibration graph.

j) Battery performance might be significantly degraded when cold soaked. Manufacturer's performance data should be consulted and, if necessary, batteries removed from the aircraft and stored in warm facilities.

k) After flight, ensure that door, window, baggage and equipment bay seals are free from moisture – (if this is not done then frozen moisture could prevent doors, etc being opened easily).

10.2 Preheating

Preheating of the cockpit and cabin should be conducted under the guidelines of the aircraft, engine and avionics manufacturer's recommendations. The operator's maintenance and operations manuals should include details of the procedures, equipment and training to be used for preheating of aircraft. These should establish temperatures for cabin and engine heating requirements. The safest and most efficient means of preheating is to house the aircraft in a suitable, heated facility.

Preheating of the engines, transmissions, electronic bays, etc. should be conducted anytime the ambient temperatures are below the manufacturer's recommended operating temperatures. For quick response, or on-call flight conditions, the aircraft and engine compartments should be preheated to a temperature within normal operating limitations.

Whenever possible, a ground power unit should be used to preserve aircraft batteries and prevent shock to avionic systems caused by transferring power from start to generator feeds.

10.3 Parking aircraft in the open

If a hangar is not available and aircraft are parked in the open:

a) Meticulous attention should be given to ensuring that all covers are fitted to pitot tubes, static ports, ram air ducts, and engine intakes and that control locks are inserted.

b) Aircraft should be tied down when required, using approved equipment and tie-down schemes. This should include securing propellers and rotor blades.

c) Batteries, not fully charged, will lose a large percentage of their efficiency while in temperatures below –30°C. Batteries should be removed if the aircraft is to be parked for lengthy periods in these temperatures.

d) Tyres on an aircraft parked in the open during cold weather develop flat spots where the tyres contact the ground. This 'set' in the tyres is temporary and disappears quickly when the aircraft is taxied.

e) Landing gear might freeze to the surface after standing. Care should be taken when first moving.

10.4 Cold weather fuels and lubricants

At temperatures near or below –47°C (the freezing point of Jet A-1), consideration should be given to using Jet B or equivalent fuel if the aircraft is certified for its use. However, Jet B is a more volatile fuel, therefore a separate risk assessment should be undertaken and procedures put in place for the handling of Jet B.

The following should be considered:

a) Fuel anti-icing additives and their effects on fuel filters and tank systems.

b) As maintenance procedures, aircraft performance and fuel consumption figures might be affected, detailed advice should be sought from the aircraft manufacturer.

c) Ground support equipment might also need additives in the fuel to prevent gelling.

d) Cold weather increases the likelihood of the accumulation of static electricity when using pumping equipment and powerful static discharges present a risk of fire and serious injury to personnel. Bonding integrity should be regularly checked and procedures modified to minimize the danger.

e) The presence of water in fuel can lead to the formation of ice crystals which can block filters and cause damage to sophisticated aircraft fuel control systems. The use of fuel system icing inhibitors should be considered, even if the surface temperature is above freezing, as aircraft might be flying at altitudes where the temperature is considerably lower. Airframe manufactures should be consulted for suitability of these fluids.

10.5 Refuelling precautions – Static electricity

Extreme care should be exercised when re-fuelling aircraft which are parked on snow or ice as there is an increased risk of the build-up of static electricity. In particular, high static charges can build up during snow removal as snow is brushed off fuselages and wings.

Ensure that the aircraft is grounded properly by connecting the cable first to ground and then to the aircraft, and that the nozzle is connected to the aircraft prior to opening the fuel cap.

10.6 Ground handling

Towing vehicles with four-wheel drive or tyre chains on the wheels might be necessary for aircraft movement.

The operation of towing equipment becomes more hazardous during cold weather operations due to ice and snow on the towing surface. Stopping distance will be increased – caution should be used when towing on an incline due to poor traction.

Specialized training and procedures might be needed for ground handling in cold weather operations.

De-ice/anti-ice equipment should be available for any location where the aircraft might operate under cold weather conditions.

Additional cold weather personnel protective equipment (PPE) should be made available and used.

10.7 De-ice/Anti-ice

10.7.1 General

Clean aerodynamic flight surfaces are critical to flight safety and aircraft performance. By regulation, pilots may not take off in an aircraft when frost, ice or snow is adhering to the surfaces.

De-icing may be accomplished by the following means:

a) application of heated water followed by undiluted glycol based fluids, or

b) by applying a heated water/glycol solution, or

c) by mechanically brushing off snow and ice prior to application of de-ice/anti-ice fluids; or

d) by placing the aircraft in a heated hangar until the contaminant melts and the surfaces are tested dry.

Consideration should be given to painting wings, rotor blades and control surfaces black to aid the melting of snow and ice when aircraft are parked in sunlight, if authorized by the aircraft manufacturer.

10.7.2 De-ice/Anti-ice procedures

Written procedures should be provided by the aircraft operator in the form of a Ground Support De-ice/Anti-Ice Manual that includes the following:

a) detailed procedures to be used for de-ice/anti-ice in line with the NAA, aircraft manufacturer and the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations* [5], as applicable. (There may be other publications available according to location.)

b) procedures for ensuring the quality and suitability of fluids for the aircraft type

c) procedures for annual pre cold weather season verification that landing areas to be used have proper ice and snow removal equipment for the operating areas, and that required de-ice/anti-ice fluids are adequate and shelf life has not/will not expire

d) de-icing fluids can be damaging to aircraft components. Manufacturer recommendations and approvals for the use of fluids should be checked for currency and assurance they have not changed

e) appropriate de-icing training for the aircraft type since composite components are susceptible to damage from de-icing operations. Physical impact, scraping, high temperatures and rapid thermal cycling may all cause damage and unseen de-lamination

f) verification should be provided that the available Type I-IV de-ice/anti-ice fluids are approved for use by the airframe, landing gear and engine manufacturer

g) training of personnel on the specific procedures and equipment to be used

h) equipment required, with verification that lift baskets are available for reaching aircraft surfaces at elevation

i) procedures for tracking the use of Type II-IV fluids. Procedures for subsequent inspection for de-hydrated Type II-IV fluids and their removal from aerodynamic 'quiet' areas to avoid the risk of re-hydration and re-freezing

j) a means to capture fluids to allay environmental concerns

k) provision for the ground staff to inform aircrews that, prior to departure, the aircraft has been properly de-/anti-iced, the type fluid used, start/beginning of holdover time, and verification that the aircraft is free of contamination

l) the calculation of holdover times following the use of de-icing fluids. This time begins when the application of the fluid is complete and expires when the fluid loses its effectiveness according to the prescribed holdover time tables (SAE or ISO). Holdover times are based on temperatures of fluids, concentrations, etc.

m) environmental protection considerations: glycol-based de-icing fluids used for commercial aircraft can be harmful to the environment.

Note that:

- automotive antifreeze is not an approved fluid for aircraft exterior surface use.
- Type I fluid is always applied heated. Types II, III and IV may be heated/unheated. Cold undiluted fluid provides longer protection.

11 Survival equipment

11.1 General

Survival equipment requirements vary by region, time to rescue, land versus sea and the environmental conditions. The Aviation Advisor should check with the NAA for guidance of any recommended or regulatory requirements.

Weight restrictions normally preclude the opportunity to carry all the desired survival equipment and rations recommended by various agencies. The Aviation Advisor should include communication, locating devices and a reliable and rapid Search & Rescue service as the primary components of the survival plan.

The following points are for consideration and to prompt discussion according to the specific nature of the operating environment, including the estimated time for rescue. The Aviation Advisor, working with the aircraft operator, should determine the appropriate equipment and quantity to be carried.

The following points should also be included in such planning:

a) Aircrews operating helicopters in a cold-weather hostile environment should wear a survival vest which at a minimum contains a voice-capable GPS Emergency Position Indicating Radio Beacon (EPIRB).

b) Access to survival equipment in the event of a mishap should be considered. Survival equipment in a baggage bay might not be accessible depending on the final resting position of the aircraft.

c) Passengers should be briefed to keep personal survival equipment and clothing readily accessible in the event of a forced landing.

d) Passengers should be trained in basic survival techniques for the region in which the aircraft operates.

e) In cold weather operations where there is a possibility of extended time to rescue, passengers should be instructed to carry an additional supply of any personal medications to cover that period. The length of the extended period should be carefully considered depending on the region and the SAR facilities. See 11.2 (Risk Assessment – Survival time versus rescue time) and 11.3 (Survival equipment lists).

f) Consideration should be given to establishing caches of survival equipment at points along overland routes.

11.2 Risk assessment – Survival time versus rescue time

Before deciding on which equipment will be required, realistic estimates of survival and rescue times in the event of a ditching or forced landing in cold weather should be established.

Factors affecting survival times may include:

a) topography

b) weather

c) air and water temperatures

d) ice, broken ice

e) land, thick ice

f) animals (e.g. bears) (This possibility may require that firearms are carried or bear hazers employed in accordance with local regulations)

g) survival equipment provided

h) training of personnel (survivors).

Response and rescue times should be realistic and established from actual exercise data. Rescue time calculations should include:

a) time for the response asset to reach the survival scene

b) time to lift or hoist all aircraft occupants to the rescue vessel/helicopter

c) time to shuttle personnel to a place of safety. A suitable response vessel is regarded as a 'place of safety', the rescue phase is considered to be complete once the survivors are sheltered and under medical care

d) time to off-load, refuel, etc. at the place of safety for any required return trips

e) It is essential to use realistic timings, including return trips in the case of more survivors than a single SAR asset can accommodate

f) sequencing of pick-up in the event of more than one SAR asset being on-scene at a time.

Every effort should be made prior to project start to have appropriate and trained assets in place for SAR services.

A risk assessment should be conducted to identify the above and other possible factors, and means found to mitigate or eliminate them where possible.

11.3 Survival equipment lists

As a general rule, survival equipment should be provided to satisfy a Survival Time of ⩾1.5 × Rescue Time (RT).

11.3.1 Suggested survival equipment lists

Shelter and warmth

a) reflective 'aluminized' (Mylar coated) space blanket or survival blanket to retain body heat (and signal)

b) lightweight poncho for protection against wind and rain

c) 'Tube tent' or sleeping bag

d) tarp with grommets or tie-tapes (best if nylon or polyester)

e) large plastic trash bag as poncho or expedient shelter roof

f) knitted or fleece 'watch cap'

g) Ferro-cerium rod (a.k.a. 'Metal match', 'Hot Spark', 'Firesteel', 'Magnesium bar') and fire striker for fire-starting

h) waterproof matches, stored in waterproof container (butane lighters will not work below freezing)

i) hexamine fuel tablets (Esbit) or 'heat tablets' for fire-starting

j) cotton balls or pads smeared with white petroleum for fire starting (can be carried in 35 mm container or heat-sealed inside large diameter plastic straw)

k) dark-coloured (black preferred) shoe polish for fire-starting.

Health and First Aid

a) First Aid kit with bandages, sterile pads and gauze, first aid tape, tweezers, surgical razor, disinfectant pads, oxytetracycline tablets (for diarrhoea or infection) and aspirin. Any material in the kit that may be damaged or rendered ineffective by water should be wrapped or sealed in plastic

b) antibiotic cream (may also be used for fire-starting)

c) salt to maintain ability to perspire

d) toilet paper (hygiene and fire starting)

e) lip balm

f) sunscreen (30 SPF or more is recommended) for when clothing cover is not available

g) polarized sunglasses (protects eyes from glare, especially at sea or in snowy environments)

h) suture kit.

Food and water

a) at least three days' worth of water (1 US gallon (3.8 l; 0.83 imp gal) – approximately 8 pounds (3.6 kg) per person per day: two quarts for drinking, two quarts for food preparation/ sanitation)). Commercially bottled water is the safest and most reliable emergency supply of water, kept bottled in its original container and unopened.

b) commercial water filter

c) metal container to boil water

d) mess tin to boil water and cook food in

e) iodine or chlorine tablets for emergency water purification if boiling or filter not available

f) collapsible (empty) water bags or containers

g) canned food, ready-to-eat meals (MRE), or high-energy foods such as chocolate or emergency food bars. Hiking meals, such as dehydrated food, can also be used, but are not ready-to-eat – they require rehydration (water), but most are prepared in the bag rather than needing a cooking vessel. Canned foods heated in a closed can may explode

h) tea, gum and hard candy (as a morale booster)

i) water purification tablets.

Signalling, navigation and reference

a) whistle

b) signal mirror with instructions

c) chemical light/glow stick – should come with a string. Tie it on and twirl the chemical light in a circle; this signal is highly recognizable to aircraft

d) flare – three fires in a triangle is the international distress signal

e) surveyor's tape – orange or chartreuse for marking location for rescuers

f) pen/pencil and paper for leaving notes to rescuers about direction of travel

g) compass and trail maps/charts (if location is known in advance)

h) survival manual for technique reference

i) portable satellite phone.

Multipurpose tools or materials

a) shovel

b) aircraft tie down kit

c) Fixed blade knife – sturdy in safe sheath

d) multi-tool knife such as Swiss Army knife

e) sharpening stone or tool

f) folding saw or cable saw

g) heavy duty needle and thread for repairing clothing and equipment

h) plastic bag(s) or trash bags

i) heavy duty aluminium foil for frying food and signalling

j) brightly-coloured bandanna or scarf for filtering water, bandage, sun protection, and signalling

k) sturdy cord or '550' parachute cord for setting up a tarpaulin

l) firearms and ammunition if required by NAA regulations

m) hatchet with sheath

n) candles for warmth, light and signalling

o) sealable plastic bags.

Life Raft survival kits

Life raft survival kits are stowed in inflatable or rigid lifeboats or life rafts. The contents of these kits are mandated by coast guard or maritime regulations. They provide basic tools and supplies to enable passengers to survive until they are rescued. Life raft(s) with survival equipment should always be carried over open water or thin ice.

a) First Aid kit

b) compass

c) distress beacons, 406 MHz (EPIRBs)

d) red flare, rocket parachute flare, and/or smoke signal flare

e) radar reflector (to help rescuers locate the raft)

f) lantern and fuel and/or searchlight

g) radio transceiver, standard VHF aircraft and/or marine

h) GPS

i) food and water

j) emergency high calorie rations
k) fishing kit
l) rainwater collection equipment
m) seawater desalination kit
n) water (typically 3 litres/person)
o) other tools and boating items
p) hatchet and knife
q) waterproof flashlight
r) heaving line
s) sea anchor (also called a 'sea drogue')
t) bailer
u) bilge pump
v) bucket
w) patch kit.

12 Airfields, heliports, helidecks and facilities

12.1 General

When practicable, aircraft should be kept in a heated hangar between flights.

If the risk of wind chill is rated 'high' or 'very high', all work should be carried out inside if possible.

Operations from open air exposed locations should be avoided whenever possible, but it will be necessary to have planned appropriately to provide air portable solutions for situations when this is unavoidable.

A heated refuge should be available for crew and technical staff in the vicinity of the aircraft operating area.

Professional guidance should be sought when planning the construction of an airstrip/heliport/helideck.

12.2 Airport design

Module 590-F, *Airfields, heliports, helidecks and facilities* [4] provides detail on the design and operation of airbases and contains additional references. Additionally:

a) In cases where the aircraft manufacturer has not provided performance data for operation on contaminated or ice runways, the operator should show that an adequate margin of safety will be applied.

b) Obstruction data and performance calculations should take account of the potential hazard of snow piled at the end of runways during ploughing.

c) Balanced field lengths should be calculated using manufacturer approved data.

12.2.1 Additional airport equipment and facility considerations

Airbase management should consider the following for cold weather operations:

a) snow and ice clearance capability

b) de-icing/anti-icing equipment

c) forced air heaters, etc.

d) aircraft tie-down points and tie-down equipment appropriate to the aircraft in use

e) additional/specialized runway marking

f) hangars should be heated: portable sources may be acceptable for temporary facilities. Precautions against fire hazards should be taken when using portable equipment for heating.

g) portable heating solutions may include (certification/approval for use on aircraft should be confirmed):

- the use of space heaters to heat cabins, cockpits and electronic bays, engines, gearboxes, etc.
- electric heating pads to preheat gearboxes
- electric heaters for engines
- the use of temporary shelters (including 'tents' to provide protection from the elements when working on particular parts of the aircraft) for necessarily prolonged operations.

12.3 Helidecks

In addition to AMG 590-F [4], consideration should be given to the following:

a) Adequacy of non-slip surfaces on the helideck, access and emergency egress routes. In cold environments with snow and ice conditions, rope or nylon weave nets will probably be necessary to provide the required friction, although this makes snow and ice removal more difficult. In snow conditions, the nylon net has proved to be easier to work with than the rope nets.

b) The effects of the environment on fire fighting and crash rescue response capability. It might be necessary to provide heated pipe work, or to open and close valves during and after flight operations.

c) Formulating procedures for the use of unmanned platforms. Their use may need to be restricted or banned if snow and ice are present on the helideck.

d) Hangars will be necessary for basing any helicopters offshore. Consideration should be given to helicopters with folding blades which have a storage advantage due to smaller hangar requirements.

e) Snow and ice clearance procedures should be in place to provide acceptable obstacle clearances.

12.4 Heliports

In extreme heavy snow areas, it may be necessary to raise lights above the normal height and displace further from the heliport edges.

Use of visual markers is recommended in areas where snow can accumulate above standard light heights.

Snow and ice clearance procedures should be in place to provide acceptable obstacle clearances.

12.5 Navigation aids and instrument approaches

GPS will generally be the preferred solution for area navigation at high latitudes due to its availability and lack of requirement for ground based equipment. GPS might, however, be less effective at very high latitudes due to errors induced by atmospheric effects and sub-optimal satellite geometry (depending on the satellite constellation used).

It may be necessary to use Differential GPS (DGPS) to achieve the necessary accuracy for terminal applications.

In some locations, where GPS is not approved for use, ILS or NDB may be used as an alternative.

12.6 Communications

By the nature of the environment, facilities might be limited, but reliable communications are vital to successful operations.

The following factors should be considered:

a) **HF radio**: This has historically been the principal method for long range communications, but HF often suffers from poor transmission and reception due to diurnal changes in the ionosphere, solar flares etc.

b) **Satellite communications**: Modern systems are reliable and cost effective and have the bandwidth to deal with large quantities of data and digitized voice capability. Existing satellite footprints may be limited in high latitudes, depending on the satellite constellation used. Flight following may also be provided by satellite based systems.

c) **VHF and VHF repeater stations**: VHF radio will remain the principal method of air/ground communication for civil aircraft for the foreseeable future, at least for relatively short ranges (<20 nm). Repeater stations may be used to extend the effective range.

12.7 Fire fighting

Due to their chemical composition, fire fighting media have temperature ratings to be applied when applicable.

Traditional water and foam-based fire-fighting systems might not be appropriate for use in extremely cold environments.

Dry powder and compressed air foams may be used on fuel fires, and aqueous film forming foam (AFFF) may be successfully used in conjunction with these at temperatures as low as –40°C when an antifreeze agent and salt-based chemical are included in the water.

13 Personnel

13.1 General

Some of the potential effects of cold weather on personnel are listed in section 3 (Personnel).

It is vital that working routines are properly structured to take account of the environment. Detailed procedures should be laid down for both aircrew and maintenance staff to prevent physical injury thereby mitigating any reduction in efficiency.

Even the simplest task may be very difficult to achieve, and appropriate levels of supervision (e.g. the use of a two-man rule) may be necessary.

13.2 Training

13.2.1 All personnel

It is recommended that all passengers and support personnel associated with operations in cold weather climates and hostile environments attend survival courses appropriate for the anticipated conditions.

13.2.2 Aircrew

All crews should complete an initial and annual recurrent arctic/cold weather operations training syllabus appropriate to the nature and location of their operations, including documented ground, flight and survival training.

This should include, but not be limited to, the following suggested topics:

a) aircraft to be operated

b) clothing to be worn

c) use of aircraft survival equipment

d) animal hazards

e) physiological effects of cold weather

f) regional meteorology and specific weather hazards

g) aircraft de-icing/anti-icing

h) review of de-icing/anti-ice systems and de-icing equipment, including the use of hold-over time tables

i) aircraft performance and flight planning

j) high latitude navigation (if applicable)

k) preparation for flight, including preheating

l) the effect of cold on dangerous goods

m) fuelling procedures

n) techniques for flight in snow including: flat light, whiteout, blowing snow

o) landing on skis (if installed), ice and snow on runways/helipads/helidecks

p) the risks associated with contaminated runway performance

q) for helicopters – landing on unprepared snow and ice, especially in remote areas. Specialized training in high hover/landing techniques, rotor wash, snow cloud situations in actual conditions should be carried out. Similar training should be carried out for external load operations

r) cold weather areas are more likely to be within remote and uncontrolled airspace so there is a need to reinforce/enhance procedures for mid-air collision avoidance

s) personal safety.

In addition to the ground school initial/recurrent/seasonal training described above, the aircrew should complete a flight training proficiency check with a qualified instructor when suitable conditions exist, covering:

a) landing and departure from snow and/or ice airbases and with skis, if installed

b) for helicopters – take off and landing on unprepared snow and ice

c) operating area familiarization and procedures including fuelling, communications and flight tracking

d) whiteout, blowing snow, and flat-light landing techniques.

If conditions do not permit flight training at the time the ground subjects are addressed, it should be completed and documented at the first opportunity that conditions do exist.

Simulator training should include elements relevant to cold weather operations and procedures for contaminated airbase landing surfaces. Simulator training should also include enhanced training for runway overruns – which are more likely to be encountered in ice/snow conditions.

It is recommended that the free, online ground and in-flight icing courses offered by NASA be utilized [6].

13.2.3 Engineers, maintenance and ground staff

See FAA Advisory Circular 135-16, *Ground De-Icing Training & Checking* [7] for guidance on de-icing and anti-icing training requirements for company training programmes as well as advice on pre take off contamination checks.

All engineers, maintenance and ground handling staff should be given initial and annual recurrent training on specific cold weather operating hazards and procedures.

These should include but not be limited to:

a) aircraft handling and movement, including towing on ice/snow

b) use of ground equipment

c) aircraft de-icing/anti-icing

d) passenger and cargo handling

e) refuelling

f) fluid replenishment

g) aircraft maintenance in cold weather

h) effects of cold on aircraft structure and systems

i) personal safety

j) duration of exposure

k) tool handling

l) physiological effects of cold weather

m) protective clothing, use of goggles and gloves

n) safety.

13.3 Overland or thick ice survival equipment

For exposure over land or thick ice, appropriate clothing and equipment to permit survival in the event of a forced landing should be carried. This may include tents, thermal suits for each passenger and crew member and sleeping bags.

13.4 Use of immersion suits

If the exposure will be over open water, the immersion suit policy in 4.2 (Immersion suits for offshore helicopters and float planes) of AMG 590-G, *Recommended aircraft and personal equipment* [2] should be consulted.

A risk assessment should be conducted to establish whether immersion suits should be carried or worn.

Additional thermal insulation garments (TIGs) will be required in extreme cold water conditions and a layer policy (to include maintenance and daily checks of suits) should be developed and published.

13.5 Personal Locator Beacons (PLBs)

See also 4.1 (PLBs and emergency radios) of AMG 590-G, *Recommended aircraft and personal equipment* [2].

PLBs should be mandatory for helicopter and single engine aeroplane aircrew in cold weather operations, and should be considered for passengers in the same aircraft. PLBs should be attached to a vest provided to each occupant.

Spare batteries should be placed inside outerwear to extend useful battery life in cold temperatures.

14 Emergency blind landing procedure

Due to a lack of instrument and/or approach aids in remote areas, it may be useful to document a procedure to enable the aircraft to be landed safely in whiteout conditions.

The example given below is based on work carried out by the British Antarctic Survey for their ski-equipped Twin Otter aircraft. It is stressed that this is an emergency procedure and should only be used after all other options have been exhausted.

It is stressed that this is for illustrative purposes only and any such procedure should be developed and authorized in accordance with local and national regulations.

No flight should be continued into poor visibility where there is likelihood that a blind landing may become necessary.

14.1 Preparation

Blind landing sites should be identified in the area of operations. These areas should be inspected prior to commencement of operations to check that the surfaces are suitable and that there are no vertical obstructions. Prevailing wind direction should be established. Pilots should be aware that the condition of the surfaces at these sites might not always be suitable for blind landings.

In each case, it is advisable for all pilots to become familiar with these areas and likely safe approach lines.

14.2 Procedure

The following example procedure has been proven using a DHC-6 Twin Otter. Quoted figures may differ for other types. Pilots should only use this procedure as a guide:

a) If possible, once committed to a blind landing, a briefing should be obtained from the forecaster for the area that is going to be used with particular emphasis on the wind strength and direction. Onboard navigation equipment should be used to confirm the direction.

b) A straight-in approach to the area should be carried out if possible.

c) As an aid to ensuring a safe approach route, use a waypoint down wind and in a position to produce an approach that will keep the aircraft clear of any terrain while on the approach.

d) Note the height of the site.

e) Plan the descent to the area so as to avoid approaching over high ground, and to be level at 500 feet agl at least 5 NM before the landing site.

f) Before beginning the descent ensure that the GPSs agree (if more than one unit is carried) and that the radar picture is as expected.

g) Test both Rad Alts and then set the bugs at 2000 feet; ensure that they begin to read when expected.

h) Once through 2000 feet set the bugs just below 500 feet, this will allow a level off at 500 feet and the bug will act as an instant warning that a correction is needed if the aircraft descends below 500 feet.

i) During the descent the Rad Alt bugs can be set at intermediate heights and should be set just below any intended intermediate level-off heights. The Rad Alt should be set such that any indication of the warning light requires an action. Pilots should not allow themselves to get into the habit of having the warning light illuminated and being ignored.

j) Once level at 500 feet, assess the wind direction by using the aircraft drift. Correct course as necessary and check that ground speed confirms that you are heading into wind.

k) 5 NM before the landing site the aircraft should be level at 500 feet, flap 10°, IAS 80 kts and all pre-landing checks should be complete.

l) Weather radar should be set to mapping mode and at a suitable range to help maintain situational awareness with regard to terrain.

m) Once established on the approach course with 5 NM to go, re-set the Rad Alt bug at 200 feet and adjust the power in order to set up a stabilized descent at 200 feet per minute maintaining 80 kts.

n) Once stabilized in the descent and established on the desired track, the Rad Alt bug should be re-set to 20 feet. At this point, do not be too concerned about where the aircraft will land as long as any obstacles are cleared.

o) In the later stages, the rate of descent may be allowed to decrease. In some cases, this will naturally happen due to ground effect: the key is to maintain the attitude at this stage.

p) If the aircraft starts to climb by any amount or descend beyond 300 feet per minute, go-around. The VSI does lag and any attempt to re gain 200 feet per minute descent rate after the aircraft shows a climb is liable to have the aircraft impacting the ground with a high rate of descent.

q) Do not be tempted to try and round-out – fly the aircraft on to the ground at 80 kts.

r) If the aircraft is light the speed can be progressively reduced to 70 kts but again do not round-out. If a little fast, a small skip may occur; if this happens just maintain the attitude and the aircraft will settle back down.

s) On positive contact with the ground, apply full reverse and, simultaneously, positively move the stick back bringing the aircraft to a halt as quickly as possible.

t) Do not taxi other than to turn the aircraft into wind.

u) Call the flight follower with your position, details of the next schedule and shut down. If possible, put the blanks in along with the snow anchors and review the situation.

v) If a straight-in approach is not possible, fly overhead the site and carry out a teardrop procedure to be established at 5 NM inbound to the landing site. It is advisable to be stabilized at 500 feet overhead the landing site in the approach configuration before going outbound.

w) The exact shape of the procedure can be up to the pilot, but it is recommended that a 20º–30º offset is used out to 6 or 7 miles. If 30° is used, this will allow a base leg to be flown at 90° to the inbound track, using range and bearing to establish the turn inbound. Using this method allows slightly more time to get established than trying to do a continuous turn on to finals. It also allows the pilot to lengthen the inbound leg if required by letting the aircraft drift down wind.

x) It cannot be stressed enough that maintaining the correct attitude by reference to the artificial horizon and not attempting to round-out is the key to ensuring a successful blind landing. This is further aided by setting the aircraft up in plenty of time and not having to rush into the procedure. Correct use of the Rad Alt and in particular the setting of the warning bug is important in ensuring the aircraft's safety during a blind landing.

14.3 Conclusion

As stressed earlier in this section, blind landings are considered to be an emergency procedure. Good situational awareness when flying in our area of operation is essential.

Pilots should always be prepared to cancel a flight or divert, turn back or, if necessary, land in good conditions at an intermediate point. Pressing on into poor conditions with no other option but a blind landing should be avoided at all costs.

Finally, it is essential that pilots practice the procedures for blind landings regularly, in the hope that they never have to use them.

References

Only the latest version of a reference should be used.

[1] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[4] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-F, *Airfields, heliports, helidecks and facilities.*

[5] ICAO. *Manual of Aircraft Ground De-icing/Anti-icing Operations.*

[6] On-line training by NASA at http://aircrafticing.grc.nasa.gov for aircrew arctic/cold weather operations.

[7] FAA. Advisory Circular 135-16. *Ground De-Icing Training & Checking*. (Provides guidance on de-icing and anti-icing training requirements for company training programmes as well as advice on pre-take off contamination checks).

Version 1

590-S4
Specialized operations: Interim guidance on night operations

Purpose

A review of all night offshore aviation accidents was conducted on behalf of the IOGP Aviation Subcommittee, based on data collected between 1990 and 2007. It found that the night offshore accident rate was 8.4 per 100k flight hours compared to the total rate of 1.6 per 100k flight hours.

This large disparity prompted the formation of a Night Operations Working Group to study risk reduction measures.

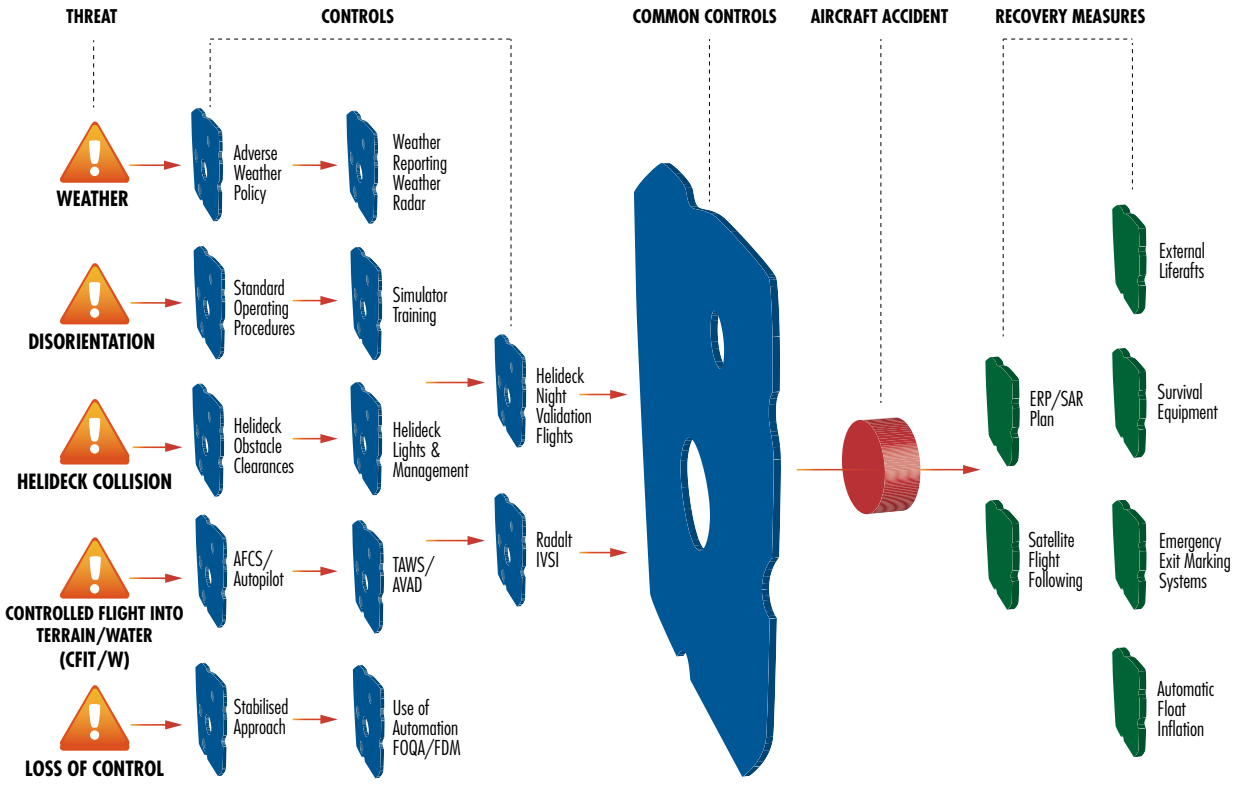
This resulting guidance provides an overview of the principal controls considered necessary for night operations, with emphasis placed on night offshore helicopter activities, both for routine planned flights and those conducted in the event of an emergency.

Scope

The guidance provided is presented in a risk-based format to emphasize the connection between threats, associated controls and applicable recovery/mitigation measures (Figure 1).

In the interest of brevity, common controls are not duplicated for each threat. The guidance is presented at a level that IOGP Members can use, where applicable, in their risk assessment process, thereby establishing clear expectations regarding management of night aviation risk with their contracted aircraft operators.

IOGP Members and air operators are encouraged to risk-assess controls to the level of detail necessary for their individual operations.



1 For reference: the International Civil Aviation Organisation define 'night' as the 'hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be prescribed by the appropriate authority. (Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon.)

Figure 1: Risk-based schematic of night operations controls and recovery measures

1 Common controls

Common controls that apply to all threats associated with night operations.

Control 1.1 Night IFR flight

Flights flown at night should be conducted in compliance with Instrument Flight Rule (IFR) procedures using IFR certified multi-engine aircraft.

For those operations where night can only be conducted under Visual Flight Rules (VFR), the aircraft operator should conduct an appropriate risk assessment.

Control 1.2 Night IFR qualified crew

Flights flown at night should be flown using two pilots, type rated on the aircraft type in use, who hold valid and current instrument and night flying ratings. The issue of fatigue should be considered when rostering crew to both night stand-by and actual night flights.

See 1.6 (Flight and duty times) of AMG 590-D, *Aircraft operations* [1],

Control 1.3 Pilot night experience

Pilots should have 25 hours night time experience before operating as Pilot-in-Command at night. In the case of offshore operations, the 25 hours should be offshore time. They should have both also completed, within the last 12 months, initial or recurrent night proficiency training.

See AMG 590-C, *Personnel qualifications, experience and training* [2] and Control 1.4.

When rostering crews for night operations, the 'pairing' of crew should be specifically considered to avoid, whenever practical, a crew having low total or recent night experience.

Control 1.4 Pilot night recency

All pilots assigned to night operations should retain night recency of not less than three night cycles in the preceding 90-days. A night cycle consists of a stabilized approach, landing and take-off.

For offshore operations, night recency is to be conducted to an offshore helideck.

Use of a simulator of the same type and series being flown may be used if agreed by the IOGP Member's Aviation Advisor provided the device has the capability of simulating the approach and landing to an offshore helideck. In addition, the specific device to be used must be approved for that use by national authorities.

In extreme latitudes, where night time is limited during summer months, a 'summer alleviation' to this requirement may be agreed by the IOGP Member's Aviation Advisor.

Control 1.5 Night ground training

Air operators engaged in night offshore activities should conduct annual ground training on night offshore operations for pilots.

Control 1.6 Emergency Night Flight Policy

An Emergency Night Flight Policy should be established in all circumstances when night flights can reasonably be expected to be requested in response to medical, weather or other emergencies. IOGP Members, in consultation with the air operator, should develop, using a risk assessment methodology, a documented night medevac/emergency policy.

This should be issued to both parties and have a suitable level of authorization to request such flights. In recognition of their higher risk, night offshore emergency flights should only be requested in genuinely life-threatening situations where the risk of waiting until first light is considered to outweigh the risk of an emergency night flight. Once the cause of the emergency is over, subsequent flights, such as for re-manning, should be conducted under the Non-Emergency Night Flight Policy.

Pilots should be rostered for night stand-by duty in accordance with 1.6.4.4 (Night standby duty) of AMG 590-D, *Aircraft operations* [1],

Control 1.7 Non-emergency night flight policy

The scheduling of non-emergency night flights should only be undertaken after a risk assessment by the IOGP Member Company that considers in-particular the effectiveness of the Emergency Response/Search and Rescue (SAR) capability. Non-emergency night winching should be avoided. See AMG 590-S5, *Specialized operations: Hoisting* [3].

2 Weather – controls

Weather conditions force the aircraft to deviate from original flight path and result in an aircraft accident.

Control 2.1 Adverse weather policy

When weather conditions have the potential to question the ability to provide a suitable SAR capability, an Adverse Weather Policy should be developed to provide a formalized process between the aircraft operator and the Company to communicate when night flying operations should be restricted or temporarily halted. The policy should consider the potentially higher risk of night operations and the greater SAR challenges. Limitations at night, for example for sea states or for pitch, roll and heave of floating helidecks, will normally be more restrictive than during daytime.

See 1.7 (Aviation weather guidance) of AMG 590-D, *Aircraft operations* [1].

Control 2.2 Weather reporting

Destination weather reporting should follow 1.7 4 (Weather reports) of AMG 590-D, *Aircraft operations* [1]. Wind indicating systems should be illuminated.

Control 2.3 Weather radar

All aircraft contracted to be able to operate at night should be fitted with colour weather radar. In the event the weather radar becomes unserviceable, the aircraft should not be flown at night in IMC and only if the weather forecasts indicate there is no likelihood of thunderstorms, lightning, turbulence or icing.

3 Disorientation – controls

Handling pilot becomes disorientated and results in aircraft accident.

Control 3.1 Standard Operating Procedures

The air operator is to have documented CRM/Standard Operating Procedures (SOPs) pertaining to night operations which should include stabilized approach criteria and a clear missed approach/go-around procedure (see also Control 6.1). Challenge and response checklists should be used that reflect these procedures and clearly define each pilot's responsibilities. SOPs for day IFR and night operations should not differ.

Control 3.2 Simulator training

Crews operating any aircraft at night should attend initial and recurrent type specific simulator training or Flight Training Devices when reasonably available for that aircraft type.

See 1.5.5.2 (Applicability) of AMG 590-C, *Personnel qualifications, experience and training* [2].

Use of simulators for crews operating offshore at night should incorporate dedicated night operations to offshore facilities and include:

- stabilized approaches
- instrument approach procedures
- missed approaches/go-arounds
- emergency procedures
- simulation of subtle crew incapacitation
- visual to instrument recoveries
- other known flight occurrences unique to the offshore environment.

4 Helideck collision – controls

Aircraft impacts helideck structure resulting in an accident.

Control 4.1 Helideck obstacle clearances

For helidecks requiring a night capability, ICAO, Annex 14, Volume II, *Heliports* [4] should be used in design considerations, construction or major rework for helipad size and obstacle determination.

Practical application of this standard for offshore operations is referenced by CAP 437, *Standards for Helicopter Offshore Landing Areas* [5].

Control 4.2 Helideck lights & management

All new helidecks, or those in for major refurbishment, should have helideck illumination designed to meet the requirements of ICAO, Annex 14, Volume II, *Heliports* [4] (again CAP 437, *Standards for Helicopter Offshore Landing Areas* [5] details practical implementation). It should be noted that the 'green' perimeter lights are a considerable enhancement to safety.

Deck lighting should be maintained with Helideck Landing Officers (HLOs) and aircrew being diligent to report deficiencies. HLOs and other personnel should be acquainted with, and equipped for, the extra hazards of night operations.

Control 4.3 Helideck night validation flights

Helideck acceptance for new facilities should take into account night lighting.

Dedicated night validation flights, commanded by a training captain and accompanied only by personnel considered essential for the validation, should be conducted to all new-build platforms and when any major change has been made that might affect night illumination. The objective of the validation flight is to confirm suitability of helideck obstacle illumination, platform lighting, and instrument/visual approaches to the platform in ambient surroundings, with any deficiencies being rectified prior to routine night helicopter operations.

5 Controlled Flight Into Terrain/Water (CFIT/W) – controls

An airworthy aircraft under the control of crew is flown into the ground (or water) resulting in an accident.

Control 5.1 AFCS/Autopilot

Aircraft operated at night should be fitted with a serviceable autopilot or AFCS with the associate crew responsibilities clearly defined in the operator's SOPs. All helicopters expected to conduct SAR or hoist-operations at night should have an auto-hover capability.

See AMG 590-S5, *Specialized operations: Hoisting* [3].

Control 5.2 TAWS/AVAD

Aircraft that may be tasked to provide flight at night and on long-term contract should be fitted with an approved and serviceable Class A Terrain Awareness and Warning System (TAWS) or AVAD capability with appropriate voice warnings compatible with offshore approach procedures. The operator should have corresponding procedures outlining the action to be taken by the crew in the event of an alert.

Control 5.3 Radalt/IVSI

All aircraft flown at night should be equipped with at least one radio altimeter with dual displays with visual and audio warnings. Both displays should be serviceable for any flight at night or conducted under IFR irrespective of any allowances offered by the approved Minimum Equipment List (MEL).

Furthermore, aircraft operated at night should be fitted with two instantaneous vertical speed indicators.

6 Loss of control – controls

A crew loses control of an airworthy aircraft and results in an accident.

Control 6.1 Stabilized approaches

Aircraft operators are to detail type-specific stabilized approach and mandatory go-around procedures in the relevant section of the Operations Manual. See Flight Safety Foundation ALAR Briefing Note 7.1 [6].

Control 6.2 Use of automation

Aircraft operators should reference use of automation in the relevant section of the Operations Manual, considering both the benefits and associated hazards.

Control 6.3 Flight Operations Quality Assurance (FOQA)/Flight Data Monitoring (FDM)

Long-term contracts should require a FOQA/FDM capability that is routinely used to assess, among other things, approach and landing standards. Night approaches and landing should also be trended separately.

7 Recovery measures

Mitigating defenses in the event of an aircraft accident.

Control 7.1 Emergency response/Search & Rescue (SAR) plans

Emergency response and SAR capability/performance should be considered for night helicopter activity, with particular focus when operating in hostile environments and the Adverse Weather Policy. As a minimum, there should be consideration of the estimated survival times of personnel given environmental conditions and mitigating measures (such as survival suits etc.) and the availability, readiness and effectiveness of available night SAR resources and estimated rescue times.

See 1.7 (Aviation weather guidance) of AMG 590-D, *Aircraft operations* [1].

Where a SAR helicopter capability is provided, they should be operated by trained SAR crews and equipped with a full night hoisting/auto-hover capability.

See AMG 590-S5, *Specialized operations: Hoisting* [3].

Control 7.2 Helicopter emergency exit marking systems

Emergency exit lighting (such as HEELS or EXIS) should be fitted to helicopters engaged in night operations and be automatically activated following the flooding of the aircraft.

See 3.5 (Cabin push-out windows, emergency lighting and seating layout) of AMG 590-G, *Recommended aircraft and personal equipment* [7].

Control 7.3 Aircraft flotation system

Offshore helicopters should be fitted with an emergency flotation system. Automatic inflation systems should be installed. The certified float sea state capability should be a factor in the Adverse Weather Policy.

Control 7.4 Externally mounted life rafts

Life rafts should be carried, and where a suitable approved modification exists, these should be externally mounted and able to be deployed internally or externally.

Control 7.5 Survival equipment

For night operations, life-jackets should be equipped with an integral light. Immersion suits approved by the local regulatory authority should be provided to crews and passengers for helicopter offshore operations in hostile environments and/or when required by a risk assessment. Other equipment such as a 're-breather' self-breathing device (or other emergency air devices) or personal locator beacon may be required by a risk assessment. Passengers and crew should be trained in the use of this equipment and helicopter underwater escape.

See AMG 590-C, *Personnel qualifications, experience and training* [3].

Control 7.6 Satellite flight following

Where possible an approved satellite tracking system should be provided to augment the flight following system. Satellite reporting intervals should be at least at two-minute intervals with higher reporting frequencies encouraged at lower levels. This may be used in lieu of the scheduled radio transmissions where suitable procedures exist to ensure data is monitored.

References

Only the current version of a reference should be used.

[1] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-D, *Aircraft operations.*

[2] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[3] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-S5, *Specialized operations: Hoisting.*

[4] ICAO. Annex 14 to the Convention on International Civil Aviation. Volume II. Heliports.

[5] UK CAP 437. Standards for Helicopter Offshore Landing Areas.

[6] Flight Safety Foundation ALAR Briefing Note 7.1.

[7] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

590-S5
Specialized operations: Hoisting

Purpose

The purpose of this module of the Aircraft Management Guidelines (AMG) is to provide guidance on Search and Rescue (SAR) Operations when on sole use contract to IOGP companies, Commercial Air Transport (CAT) Helicopter Hoist Operations (HHO) for personnel transfer and Rescue and Recovery Services (RRS) described as 'Emergency Hoisting, SAR as a Secondary Task'.

Scope

This module of the AMG provides guidance on hoist (winching) operations. It includes SAR, Medical Evacuation (MEDEVAC), and CAT HHO personnel transfer.

It applies to all Members and helicopter operators who will or do conduct hoisting operations.

This guidance is intended to cover SAR Operations when on sole use contract to IOGP Companies, CAT HHO for personnel transfer and RRS.

Additional information relating to SAR can be found in AMG 590-B, *Safety Management Systems, Quality Assurance and Emergency Response* [1]. Ref [2] should be used where helicopter/ship operations are relevant.

Contents: 590-S5

1 Management

A dedicated SAR contract will normally have been generated following a structured risk assessment of passenger survivability within the context of national or regional primary SAR capabilities.

While individual Members would normally provide their own guidance on risk assessment, background guidance on survivability can be found in [3].

The risk assessment should include:

a) the survivor drop-off points designated as a place of safety (e.g. vessels or points designated for daytime use only or suitably marked and illuminated for night operations)

b) the decision-making or callout process that assesses if a person is or is not in distress.

The callout process should define:

a) an authorization process, including those persons authorized to request call out, and

b) an 'authorization to launch' process.

Where any form of either SAR or CAT HHO is tasked, the scope of the mission, planning requirements and callout process should be clearly defined in the Aircraft Operator's Operations Manual. This process should also define any limitations (night ops) or permissions provided by a Regulator Operations Specification.

All hoist and associated rescue operations should be formally hazard/risk assessed as part of the aircraft operator's Safety Management System (SMS).

Additionally, safety controls for SAR and rescue operations, identified through the hazard/risk assessment processes, should be assessed through the operator's internal Quality Assurance (QA) program.

Ideally, a helicopter operator contracted to provide SAR or CAT HHO services should have experience in the provision of SAR or hoisting services.

See references [4] and [5].

2 SAR Operating Standards, Procedures and documentation

2.1 Operations Manual

The Operator should be approved by the relevant National Aviation Authority (NAA) to conduct SAR activities if such an approval is issued in the country of operation. An Approved Supplement in the Operations Manual (if applicable) should cover SAR Operations.

The SAR procedures should be documented and include the following sections:

- Administration & control
- Radio & Visual communications
- Authorization & call out procedures
- SAR response criteria
- Crew experience & qualifications
- Weather minima and limitations for SAR, including the relevant limitations on vessel movement and wind speed
- Performance criteria – All Engines Operating (AEO) and One Engine Inoperative (OEI)
- Training & Recency requirements for all crew (Pilots, hoist Operators, Crewmen, etc.)
- NVIS procedures and training requirements
- SAR Operations; Normal & Emergency Procedures
- Duties & responsibilities for all crew (Pilots, Winch Operators, Crewmen, etc.)
- SAR winching: normal and emergency procedures (including intercom failure, winch failure, winch runaway and cable cutting)
- Pre-flight preparation & briefing
- Emergency care protocols (where applicable)
- Search procedures
- Air deployment of life rafts, including Helicopter Emergency Rapid Deployment System (HERDS) if applicable
- Recording of hoist cycles and SAR reports
- SAR equipment
- Minimum Equipment List (MEL)
- Minimum Mission Essential Equipment; including procedures for operations with degraded equipment (Limited SAR – LIMSAR).

Commercial Air Transport (CAT) Helicopter Hoist Operations (HHO) used for rescue operations. When required, relevant extracts from the Operations Manual should be made available to the company for which the service is being provided.

The helicopter should have an approved Flight Manual Supplement outlining the operation, limitations, and emergency procedures of the helicopter and hoist during hoisting operations.

2.2 Crew composition

The minimum crew for SAR and hoist operations should be as stated in the Operations Manual supplement.

In no case may the crew be less than two pilots, one SAR hoist operator and one survival specialist (rescue swimmer).

2.3 Helicopter performance

Hoist training operations should be conducted in a helicopter capable of sustaining an engine failure with the remaining engine at the appropriate power setting to provide the aircrew with the ability to transition from a hover to safe forward flight without hazard to the aircraft, suspended person(s)/cargo, third parties or property.

The ability to transition safely from a hover to forward flight after an engine failure should be supported by approved OEM performance graphs for the atmospheric conditions in which winching is to be conducted.

For hoist training operations, once established in the operating area, the aircraft commander should verify and update the pre-flight performance planning, taking into consideration the actual atmospheric and aircraft operating conditions, and confirm the ability to transition from a hover to safe forward flight following an engine failure.

Exceptions to the HOGE OEI performance requirements listed above may only be considered if authorized by the relevant NAA, with approved procedures, through an Operations Specification or by regulation and the operator has established risk mitigation measures for hoisting without OEI performance.

Exceptions to the HOGE OEI performance for actual SAR sorties may be considered however only in life threatening emergencies if:

a) authorized by the relevant NAA

b) the operator has established alternative crew actions for an engine failure that minimizes the risk to occupants, personnel on the vessel and on the hoist cable.

In calculating performance limitations for HOGE OEI, no credit should be taken for forecast wind unless it exceeds 10 knots, in which case 50% of the forecast wind may be taken into account. Calculations must include the weight on the hoist and the person being hoisted.

2.4 Aircraft and equipment fit

When selecting a suitable rescue helicopter, the following should apply:

The rescue helicopter should be twin-engine aircraft with the equipment fit identified below and should be operated in accordance with 3.3 (SAR Technical Crew).

Range and endurance of the rescue helicopter should be able to cover the area of operations; and should be of a size and weight to be able to land to many of the helidecks within the area of operations and be able to hoist to all the helidecks within the area of operations.

Rescue helicopters should be equipped for standard offshore IFR operations. See AMG 590-G, *Recommended aircraft and personal equipment* [6].

In addition to the equipment listed in section 3 (Helicopter equipment) of AMG 590-G, *Recommended aircraft and personal equipment* [6], rescue helicopters should be fitted with the equipment listed in Table 1 (Rescue helicopter equipment).

Table 1: Rescue helicopter equipment

Equipment item	Outline specification
Aircraft	Twin Engine with Single-Engine HOGE capability. Meets the minimum requirements for offshore helicopters equipment fit. Bubble windows located at each side of the fuselage (where available). 4 Axis Auto pilot (Auto Hover System) Dual RADALT
Primary rescue hoist	Dual, permanently mounted, electrically powered Variable speed unit Load capability of at least 600 lbs (272 kg) Cable length of at least 290 ft (85 m) Winch speeds with a minimum of 150 ft/min Winch fitted with guillotine (cable shear function) operable from the winch operator and pilot's positions
External lighting	Rotatable landing/search lights Fixed winch area flood lights Manually operated search light at winching position Door/Winch mounted winch operator hand lamp

Equipment item	Outline specification
Communication equipment for SAR Role	Satellite communications, may be a part of the satellite tracking system Multi-channel VHF (AM) Air Band Multi-channel VHF (FM) Marine Band Multi-channel UHF (if appropriate to area of operations) Hoist operators waterproof radio for communicating with flight crew throughout the rescue operation
Homing equipment	Multi-frequency homing, equipment on VHF (AM), VHF (FM) 406 MHz and UHF and 121.5 MHz. With sufficient fidelity, that it is able to distinguish individual targets at the lowest range selectable.
Search radar	Capable* of detecting a 6–10-person life raft in wave heights of 2 – 5 ft. ** Capability is based on the table for 'Sweep Widths for Forward-Looking Airborne Radar' in the US National Search and Rescue Supplant to IAMSAR.*
Search sensor	Suitable Electro Optic - Infrared sensors
Night Vision Imaging System (NVIS)	Helmet mounted NVIS for Pilot, Co-pilot and winch operator, or similar. (Optional, if not approved by the local Regulator)
Navigation equipment	Navigation System – with SAR search pattern Capability
Miscellaneous equipment	FM Marine Band hand held radios Side facing passenger/survivor seats. When required by type of operation, must be approved by the OEM or an approved STC and meet relevant certification requirements Sea tray fit (floor protection)
Medical equipment	The type of medical equipment to be carried is to be directed by local National Regulation and based on level of medical support/ accreditation of the medical persons on-board the aircraft.

The installation of all helicopter rescue equipment including any subsequent modifications must have an airworthiness approval appropriate to the intended function. Ancillary equipment should be designed and tested to the appropriate standard and acceptable to the NAA.

2.5 SAR equipment

The minimum rescue equipment requirements should include:

a) 2× crew harness for crew restraint

b) 3× single lift strops and static line

c) hoist operator and rescue swimmer harnesses, including quick release belt

d) protective helmets

e) hoisting gloves

f) knee pads

g) static discharge earthing wire

h) hooks and grapples

i) manual cable cutter (One pair bolt croppers or similar equipment)

j) immersion suits

k) stretchers as appropriate to the operating environment

l) hi-lines

m) emergency hoisting equipment (heave-ho)

n) grabbit hook (optional)

o) air deployable life raft (SAR raft or HERDS) if required by operational risk assessment.

2.6 Maintenance of aircraft hoists and associated equipment

Aircraft hoists and all associated equipment should be maintained as prescribed in the operator's approved maintenance programme.

The following recommendations apply:

a) Technical logs should be maintained for all hoists and lifting devices to record winch cycles and maintenance performed.

b) Time and/or cycle life limits should be established for the cable and cable-cutting squibs.

c) All bulletins, notices and directives or maintenance programmes published by the manufacturer of the airframe and the hoist should incorporated into the overall maintenance programme as appropriate.

d) All lifting devices (baskets, straps, personnel harnesses, personnel lifting devices, and any ancillary associated lifting equipment) that attach to the hoist cable should also be included in the maintenance programme.

3 Training

3.1 Training programmes

The operator should establish a written training programme and minimum qualification criteria for hoist or hoisting operations. These should be included in the approved operations manual.

All personnel (pilots and hoist operator) should have an initial competence course and thereafter an annual refresher as well as the recurrent training outlined below.

Training records should be maintained.

Training programmes are also recommended for vessel/offshore structure crews who may be involved in hoisting operations.

3.2 Pilots

3.2.1 Experience and competence

The aircraft operators Operations Manuals should contain criteria for the selection of flight crew members for the rescue/hoisting task, taking previous experience into account.

The minimum experience level for pilots conducting rescue hoist flights should:

- not be less than the NAA regulatory requirement for public transport category hoist operations
- not be less than the guidance provided in the aircrew and SAR crewmen experience and training sections (1.1.1.2, 1.2.9.6 and 3.10) of AMG 590-C, *Personnel qualifications, experience and training* [7].

In addition, Table 2 should be followed.

Table 2: Pilot experience and competence

Captain	Co-pilot
Hold a valid line check certificate as a SAR Commander.	Hold a valid line check certificate as a SAR Co-Pilot.
Hold any valid specialist competency certificate as a SAR Commander appropriate to the location/ contract (i.e. External Load competency, etc.)	Hold any valid specialist competency certificate as a SAR Co-Pilot appropriate to the location/ contract (i.e. External Load competency, etc.)
Successful completion of a formal SAR training course or previous SAR experience, that includes at least 50 hoist cycles conducted offshore. 20 hoist cycles should be at night if night operations are being conducted offshore. A hoist cycle means one down-and-up cycle of the hoist hook.	

In addition, the following previous experience is desirable:

- military or civil SAR
- mountain flying and external load operations.

3.2.2 Proficiency training

Pilot proficiency checks should include procedures likely to be used at winching sites with special emphasis on:

a) local area meteorology

b) Winching Operations flight planning

c) winching departures

d) NVIS Training (if applicable)

e) a transition to and from the hover at the target location

f) Normal and simulated emergency winching procedures

g) crew coordination and, in particular, good communication (standard patter).

In addition, a full SAR Operation should have a Risk-Based Proficiency Training Programme in place, which follows a detailed course covering all likely scenarios. This training should be tracked in the same manner to all other training, and is likely to require allocation of number training hours in the contract.

A typical programme should cover the items in Table 3.

Table 3: Pilot Risk-Based Proficiency Training Programme

Operational proficiency training	Criteria
Deck Training (every 90 days)	6 deck hoist circuits (One of each to be completed at night unless seasonal limitations preclude night training (high latitudes) to include: • 2 high/trail line • 2 stretcher/basket lifts • 2 Crew Hover Trim (where appropriate)* ** If not appropriate, it is expected that two additional hoists with other rescue devices should be conducted.*
Wet Training (every 90 days)	8 hoist evolutions (One of each to be completed at night unless seasonal limitations preclude night training (high latitudes)) – to include (minimum): • 2 dummy/drum lifts* • 2 live lifts** • 2 basket lifts (where appropriate***) • 2 free fall rescue swimmer deployments (where appropriate***) ** Can be substituted with live or basket lifts* *** Where survivors face a hypothermia threat, lifting/hoisting hypothermic survivors should be practiced* **** If these devices/deployment methods are not used it is expected that the operator should conduct four additional Wet lifts with other rescue devices for proficiency.*
General (Every 90 days)	2× Search techniques using on-board sensors (e.g. EO-IR/FLIR), and NVGs as appropriate. 2× NVIS flights (when NVIS are approved) either in the aircraft or approved full flight simulator. 2× Dual hoist hook changeover. (when approved in the RFM) 2× Emergencies and equipment malfunctions, as required. 2× Confined Area Landing (CALs) if onshore SAR is contracted.* ** Mountain flying & hoisting operations – amount & frequency to be defined in the SAR procedures documentation where appropriate.*

3.2.3 Recurrent training and checking

All pilots should be trained in the following subjects annually:

a) normal and emergency winch procedures

b) crew coordination concept specific to winching (Ideally aircrew and SAR crew should be trained together)

c) practice of winching procedures

d) NVIS (if applicable)

e) the dangers of static electricity discharge.

3.3 SAR Technical Crew

3.3.1 Experience and competence

Past operational SAR experience is highly desirable.

As a minimum for competence, the recommendations in Table 4 should be in place for SAR Technical Crew members (hoist operator and rescue swimmer):

Table 4: SAR Technical Crew experience and competence

Hoist operator	Rescue swimmer/winchman
Completed a formal training course or previous experience that included at least 50 hoist cycles* conducted offshore. 20 hoist cycles* should be at night if night operations are conducted offshore.	Completed a formal training course or previous experience that included at least 50 hoist cycles* conducted offshore. 20 hoist cycles* should be at night if night operations are conducted offshore.
Hold a valid Line check certificate as a hoist operator.	Hold a valid Line check certificate as a rescue swimmer/winchman.
At least one of the SAR technical crewmembers should hold at least a basic Emergency Medical Technician (EMT) or equivalent certification/ approved by the appropriate regulatory agency unless a stand-alone EMT or medical equivalent is serving as an additional member of the crew. ** A hoist cycle means one down-and-up cycle of the hoist hook.*	

The crew members should be an employee of, or direct contractor to the helicopter operator, whether full time or part time.

Each Technical Crew member should have completed a formal and recorded training scheme in accordance with the procedures contained in the Operations Manual and should include the following items:

a) basic weight and balance

b) aircraft safety and survival equipment

c) emergency procedures – to include winch problems, fouling of the cable, severing of the cable, use of manual cable cutters, etc.

d) Technical details of winch operation

e) First aid and cold water recovery techniques including cold shock and hypothermia

f) Wet dinghy drill

g) Search & rescue/coastguard local organization.

3.3.2 Proficiency training

A full SAR Operation should have in place a Risk-Based Proficiency Training Programme, which follows a detailed course covering all likely scenarios. This training should be tracked in the same manner to all other training, and is likely to require allocation of number training hours in the contract.

SAR Technical Crew proficiency checks should include procedures likely to be used at hoisting sites.

Hoist operator techniques should be practiced over both land and water. Over water training is preferred for pilots and crewmen to practice the approach and lower into position in reduced visual reference conditions.

A typical programme should cover the items in Table 5.

Table 5: SAR Technical Crew Risk-Based Proficiency Training Programme

Operational proficiency training	Criteria
Deck Training (Every 90 days)	6 deck hoist circuits (One of each to be completed at night unless seasonal limitations preclude night training (high latitudes) to include: • 2 high/trail line • 2 stretcher/basket lifts • 2 Crew Hover Trim (where appropriate)*. ** If not appropriate, it is expected that two additional hoists with other rescue devices will be conducted.*
Wet Training (Every 90 days)	8 hoist evolutions (One of each to be completed at night unless seasonal limitations preclude night training (high latitudes)) to include (minimum): • 2 dummy/drum lifts* • 2 live lifts** • 2 basket lifts (where appropriate***). • 2 free fall rescue swimmer deployments (where appropriate***) ** Can be substituted with live or basket lifts* *** Where survivors face a hypothermia threat, lifting/hoisting hypothermic survivors should be practiced* **** If these devices/deployment methods are not used it is expected that the operator will conduct four additional Wet lifts with other rescue devices for proficiency.*
General (Every 90 days)	2 × Search techniques using on-board sensors (e.g. EO-IR/FLIR), and NVGs as appropriate. 2 × NVIS flights (when NVIS are approved) either in the aircraft or approved full flight simulator. 2 × Dual hoist hook changeover. (when approved in the RFM) 2 × Emergencies and equipment malfunctions, as required. 2 × Confined Area Landing (CALs) if onshore SAR is contracted.* ** Mountain flying & hoisting operations – amount & frequency to be defined in the SAR procedures documentation where appropriate.*

3.3.3 Recurrent training and checking

The rescue crew member should be trained in accordance with the following annually:

a) duties in the SAR role

b) fitting and use of the winch, with support from qualified maintenance staff, as appropriate

c) operation of winch equipment

d) preparing the helicopter and specialist equipment for SAR

e) normal and emergency procedures for helicopter and winch

f) crew coordination concepts specific to SAR (Ideally this should be conducted with the aircrew)

g) operation of intercommunications and radio equipment

h) knowledge and operation of emergency winch equipment

i) techniques for handling SAR passengers

j) effect of the movement of personnel on the centre of gravity and mass during SAR

k) effect of the movement of personnel on performance during normal and emergency flight conditions

l) techniques for guiding pilots over SAR sites

m) NVIS Training (if applicable)

n) awareness of specific dangers relating to the operating environment

o) recurrent training should include an aircraft safety and survival check

p) the dangers of static electricity discharge.

4 Commercial Air Transport HHO Operating Standards, Procedures and documentation

In offshore operations, non-rescue personnel transfers are often achieved by helicopter, as is the case for a limited number of onshore scenarios, i.e. Pilot Transfer, Windfarm support, offshore helicopter recovery etc. Hoisting of personnel can result in additional risks and should only be made after a formal risk assessment has been conducted as part of the Aircraft Operators SMS. Hoisting operations, including training, should only be undertaken when judged operationally essential, and then strictly in accordance with the specified procedures outlined in [2] and [9].

The Operator should be approved by the local NAA to conduct CAT HHO if such an approval is issued in the country of operation. An Approved Supplement in the Operations Manual (if applicable) should cover CAT HHO Operations.

RRS described as 'Emergency Hoisting, SAR as a Secondary Task' should be conducted as CAT HHO.

4.1 Operations manual

The helicopter operator should have an approved Helicopter/Ship Operations Manual or Operations Manual Supplement outlining the following for CAT HHO:

- responsibilities of crew members
- equipment standards
- pre-flight responsibilities, preparation & briefing
- communications
- procedures at winching area
- approach and departure procedures
- weather minima & limitations for CAT HHO, including the relevant limitations on vessel movement and wind speed
- performance criteria – All Engines Operating (AEO) and One Engine Inoperative (OEI)
- Training & Recency requirements for all crew (Pilots, Hoist Operators, Crewmen, etc.)
- CAT HHO Operations; Normal & Emergency Procedures
- duties & responsibilities for all crew (Pilots, Hoist Operators, Crewmen, etc.)
- CAT HHO Hoisting; Normal & Emergency Procedures (including intercom failure, hoist failure, winch runaway and cable cutting)
- recording of hoist cycles
- Minimum Equipment List (MEL).

Night CAT HHO hoisting should not be conducted unless the helicopter is properly equipped with items such as auto-hover and the crew (including hoist operator) is trained and current as outlined in the company Operations/Training Manual.

4.2 Aircraft performance

All CAT HHO Operations should be carried out in accordance with the requirements of the relevant NAA and aircraft conducting CAT HHO should be capable of sustaining a critical engine failure with the remaining engine(s) at the appropriate power setting without hazard to the suspended person(s)/cargo, third parties or property.

4.3 Experience and competence

All CAT HHO Pilots and Technical Crew should meet the requirements specified by the relevant NAA and the Operations Manual.

In the absence of other requirements, Table 6 should be used.

Table 6: CAT experience and competence

Pilots	Hoist Operator
Completed a formal training course or previous experience that included at least 50 hoist cycles* conducted offshore. 20 hoist cycles* should be at night if night operations are conducted offshore.	Completed a formal training course or previous experience that included at least 50 hoist cycles* conducted offshore. 20 hoist cycles* should be at night if night operations are conducted offshore.
** A hoist cycle means one down-and-up cycle of the hoist hook.*	

4.4 Proficiency training

All CAT HHO Pilots and Technical Crew should meet the Proficiency requirements specified by the relevant NAA and the Operations Manual.

In the absence of other requirements, a Risk Based Proficiency Training Programme should be in place (Table 7), which follows a detailed course covering all likely scenarios.

Table 7: CAT Risk-Based Proficiency Training Programme

Operational proficiency training	Criteria
Hoist Training (Every 90 days)	6 hoist circuits (One of each to be completed at night unless seasonal limitations preclude night training (high latitudes) to include: • 2 high/trail line • 2 stretcher/basket lifts • 2 Crew Hover Trim (where appropriate)* ** If not appropriate, it is expected that two additional hoists with other devices will be conducted.*

4.5 Recurrent training and checking

All CAT HHO Pilots and Technical Crew should meet the Recurrent Training and Checking requirements specified by the relevant NAA and the Operations Manual.

In the absence of other requirements, the details listed for SAR Pilots (in 3.2) and Technical Crew (in 3.3) should be used as a basis for a programme.

4.6 CAT HHO passengers for transfer

All CAT HHO passengers should receive a documented training programme and a full emergency briefing, including the following as a minimum:

a) Wearing of and use of survival equipment prior to a flight

b) Practice of donning and using the lifting strop

c) Hoisting procedures and crew signals.

The training programme should be appropriate to the exposure of the passenger and can normally be carried out on the ground with the aircraft shut down. However, all effort should be made to carry out live training as part of the programme.

References

Only the current version of a reference should be used.

[1] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-B, *Safety Management Systems, Quality Assurance and Emergency Response.*

[2] International Chamber of Shipping (ICS). *Guide to Helicopter/Ship Operations.*

[3] Transport Canada. TP13822E, *Survival in Cold Waters.* http://www.tc.gc.ca/eng/marinesafety/tp-tp13822-menu-610.htm

[4] IMO/ICAO. Doc 9731-AN/958. *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*. Volume 2, *Mission Coordination*, of this manual provides guidance on planning and coordination of SAR operations and exercises.

[5] UK CAP 999.*UK Helicopter Search and Rescue (SAR) – National Approval Guidance*. EU No. 965/2012.

[6] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-G, *Recommended aircraft and personal equipment.*

[7] IOGP. Report 590, *Aircraft Management Guidelines* (AMG). Module 590-C, *Personnel qualifications, experience and training.*

[8] Regulation (EU) 965/2012 on air operations.

590-S6
Unmanned aerial systems

Purpose

An upsurge in commercial unmanned aerial vehicle (UAV) activity and an ever-increasing number of manufacturers and operators led to the establishment of these guidelines for unmanned aerial systems (UAS).

Since the terms unmanned aerial vehicle, unmanned aircraft system and remotely piloted aircraft (RPA) are often used synonymously, this module uses the term UAS to standardize and describe all unmanned aerial systems.

This module is not exhaustive nor should it be considered the only source of reference. It is meant to be used as a basis to develop further guidelines.

Members should check with the controlling civil aviation authority in which the UAS will be operated.

Scope

This module provides guidance for personnel seeking UAS services and those desiring information to help manage service providers operating a UAS.

This module considers the entire system, not just the vehicle, when operating UAS.

A UAS has four subsystems:

- aircraft
- data links (control and return)
- ground control equipment
- the pilot/operator.

In general, UAS operations can occur:

- within visual line of sight (VLOS)
- within extended visual line of sight (EVLOS) (within electronic line of sight of the ground control station)
- beyond visual line of sight (BVLOS).

UAS may be controlled manually by a pilot or autonomously through use of programing and autopilot.

UAS can vary in size from those weighing less than a pound to some the size of a commercial jet. This module applies regardless of size.

The definitions in this module are used by civil aviation authorities globally. The UAS industry is in its infancy. Definitions and regulations are changing almost on a weekly basis. Members should contact their local civil aviation authorities for the latest regulations and references for UAS operations. Additionally, professional UAS organizations may provide information to assist member companies in development of UAS policies and development of UAS safety programs.

Other organizations, such as the International Civil Aviation Organization (ICAO) and RTCA, Inc., have also developed terms and definitions which may differ from those used by local civil aviation authorities.

Aviation Safety Advisors may wish to refer to the current version of ICAO Circular 328, *Unmanned Aircraft Systems (UAS)* [1] and RTCA Guidance DO-304, *Guidance Material and Considerations for Unmanned Aircraft Systems* [2] until harmonization of terminology is achieved.

Contents: 590-S6

1 General operating rules

UAS should be operated in accordance with all applicable local, state and federal regulatory requirements.

a) Offshore UAS operations in support of oil and gas should be in compliance with local civil aviation authorities' regulations. Offshore UAS operators should also comply with any local laws governing UAS operations.

b) UAS operators should comply with any environmental laws and regulations when operating UAS Offshore.

c) A Notice to Airman (NOTAM) should be issued for the affected airspace of UAS operations where required by the regulatory authority. NOTAMs should be filed by the Pilot in Command (PIC).

d) Regulatory NOTAM guidance and other applicable Recommended Practices should be adhered to for UAS operations that could pose a potential hazard to manned aircraft operations.

e) Operating documents: Operators should maintain documentation of system operating certification, flight operations manual and local civil aviation authority pilot certifications (as required) for each operation at the point of control of the UAS operation.

f) **In situations where manned aircraft pose a potential conflict with UAS operations, manned aircraft have the right-of way and UAS operations should be terminated until the potential conflict has passed.**

Pilot in Command (PIC). The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate license, if applicable, for the conduct of the flight. Refer to local civil aviation authorities to determine the responsibility and authority of the PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

Note: A PIC can only be the PIC for one UAS at a time. For an Operating Pilot Assistant (OPA), the PIC should meet UAS guidance requirements for training, pilot licensing, and medical requirements, if applicable when operating an OPA as a UAS.

The member's HSE personnel should conduct a risk assessment for any UAS operations where explosive vapour might be present. If available, an intrinsically safe (explosion-proof) UAS should be considered.

CERTIFICATES OF INSURANCE: The member company should determine if the level of insurance provided by the UAS operator is acceptable to the member's company risk management.

All UAS should use 'sense and avoid' technology on the aircraft and a mode 'S' or ADS-B capable transponder whenever practical and allowed by the regulating authority.

All UAS should meet the manufacturer's technical design specification and be in airworthy condition. The UAS should have complete maintenance records from manufacture to current deployment. If required, the UAS should have an airworthy certificate (equivalent to type certificate) and the operator should be licensed by the regulating authority. In cases where no applicable regulatory standard is available to determine airworthiness, the operator should assert an equivalent level of safety to manned aircraft through adherence to maintenance and safety checklist usage recommended by the UAS manufacturer.

The UAS operator should provide an airworthiness maintenance program, including a maintenance training program, and any unique skills or maintenance practices relating to their UAS. The operator should have a process to report applicable data relating to the maintenance of an operation.

Airworthiness. A condition in which the UAS (including the aircraft, airframe, engine, propeller, accessories, appliances, and control station (CS) conform to manufacturer's technical specifications and, its type certificate (TC), if applicable, and is in condition for safe operation.

2 Operations

All UAS operations should be controlled by a Pilot in Command (PIC). Completely autonomous UAS operations should not be conducted. A PIC may not control more than one UAS.

Where UAS operations are conducted in airspace utilized by manned aircraft, the PIC should be certificated or authorized by the local Civil Aviation Authority if applicable. The member's Aviation Advisor should approve of any PIC conducting UAS operations for the company.

a) A safety case should be submitted by the operator to the responsible party addressing the experience and skills of the PIC as it relates to the UAS operation being considered.

b) The potential to interact with manned aircraft, applicable civil aviation requirements, the size and capability of the UAS platform and the risk of the overall operation should be primary considerations in the type of experience and skills required.

Supplemental pilots. Supplemental pilots are those pilots assigned UAS flight duty to augment the PIC. It is common for operators to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions.

a) Supplemental pilots should have, at a minimum, successfully completed the operators training program and, have been authorized by the company to operate the UAS. If applicable, the supplemental pilot should hold the same certification as the PIC if required by the local civil aviation authority.

b) Recent Pilot Experience. The operator/applicant should provide a process that ensures that pilots maintain an appropriate level of recent pilot experience for the position they are assigned in the UAS being operated.

c) Medical. Supplemental pilots should maintain, at a minimum, a valid local civil aviation authority medical certificate if applicable.

External pilot. A UAS pilot who flies from outside a control station with direct visual contact with the aircraft.

Visual Line of Sight (VLOS). Operating within Visual Line of Sight means that the PIC or visual observer is able to maintain direct, unaided (other than corrective lenses and/or sunglasses) visual contact with the unmanned aircraft, which is sufficient to monitor its flight path in relation to other aircraft, persons, vessels, vehicles and structures for the purpose of avoiding collisions. VLOS operations are normally accepted out to a maximum distance of one-half nautical mile horizontally and 400 feet vertically from the UAS pilot.

Extended Visual Line of Sight (EVLOS). EVLOS operations are operations where the PIC is still able to comply with his collision avoidance responsibilities, but the need for the remote pilot to maintain direct visual contact with the unmanned aircraft is addressed via other methods or procedures. It is important to note, however, that collision avoidance is still achieved through 'visual observation' (by the PIC and/or UAS Observers.) All UAS operations should occur within VLOS, or EVLOS range. Operations beyond visual line of sight are not recommended unless an approved method of aerial separation and collision avoidance exists and the operations are in accordance with local civil aviation authority requirements.

The operator should submit a safety case including a risk assessment for the EVLOS operation. Factors taken into consideration should include:

a) the procedures for avoiding collisions

b) aircraft size and configuration

c) aircraft color and markings

d) aircraft aids to observation

e) meteorological conditions and visibility, including background conditions (cloud/blue sky)

f) the use of deployed observers

g) operating range limits – suitable radio equipment should be fitted in order to be able to effect positive control over the unmanned aircraft at all times

h) contingency plans for loss of link event.

UAS operations (including night operations if approved by the local authorities) should utilize one or more trained visual observers to assist the PIC with see-and-avoid responsibilities by scanning the area around the aircraft for intruder traffic and assisting the PIC with navigational awareness. The visual observer(s) should have a reliable method of instantaneous communications with the PIC such as two-way radios. Cellular phones are not considered reliable for this purpose. The PIC and visual observer(s) together should have a view of the area that is sufficient to allow enough time for the PIC to de-conflict as required.

Spacing multiple visual observers and/or antennae in a linear manner ('daisy-chaining') to increase operational distance beyond should generally be avoided. Operations involving 'daisy-chaining' observers/antennae may be permitted if an acceptable safety case is presented by the operator demonstrating the risks are sufficiently managed. These operations would normally fall under Extended Visual Line of Sight (EVLOS) or Beyond Visual Line of Sight (BVLOS) regulations. EVLOS operations are normally beyond a distance of 500 metres horizontally and 400 feet vertically from the Remote Pilot.

When multiple visual observers are being used, it is important for the PIC to know which visual observer(s) have direct visual contact on the aircraft.

Visual observers should:

a) be in communication with PIC either within speaking distance or with a portable radio

b) be trained in areas such as aviation terminology, Visual Flight Rules (VFR), airspace requirements and applicable aviation regulatory requirements

c) keep the pilot informed of possible hazards (power lines, crane/venting booms, birds, other aircraft, approaching workboats (when working underneath facility), and weather conditions

d) establish an observation position having a clear view of the UAS operating area

e) meet any medical or physical requirements mandated by the local civil aviation authority.

f) be designated as such and not share in any other duties associated with the flight

g) be briefed on lost communications procedures prior to the flight.

Weather observation.

a) A reliable method of determining wind speed, ceiling and visibility should be used.

b) Weather observations should be taken near the operation that it is certain that they are valid; for example, an airport's observations can be used if the airport is within a few miles and the conditions appear to be uniform.

c) Ceiling may be determined by the temperature/dew point spread.

Night operations. Night operations (if approved by the local authorities) may be considered if the operator provides a safety case and sufficient mitigation to avoid collision hazards at night. External pilots and observers should be in place 30 minutes prior to night operations to ensure dark adaptation.

Experience/currency. UAS operators should provide documentation showing pilots maintain an appropriate level of recent experience in the UAS being operated in flight or in a flight simulation training device (FSTD). At a minimum, the PIC should conduct three takeoffs (launch) and three landings (recovery) in the specific UAS within the previous 30 days, or as prescribed by the operator/applicant's recurrent training and currency program, if approved by the member's Aviation Advisor.

In addition to the training required for UAS PICs, the following additional training (or local civil aviation authority recognized equivalent) should be completed:

a) normal, abnormal, and emergency procedures in all specific details of the UAS being operated

b) manufacturer-specific training (or a local civil aviation authority accepted equivalent) if available.

c) demonstrated proficiency

d) defined interval testing on the UAS being operated (i.e. semi-annual, quarterly, etc.).

Communication should be coordinated between the UAS operating team with a clearly defined command role and responsibility.

Radio communication protocol appropriate to the airspace should be followed. Where communications are not specifically required by local civil aviation authority regulations, such as in uncontrolled airspace, there should be an announcement on appropriate aviation frequency prior to launch, just after launch, periodically during operations, and after landing.

Announcements should include at least:

a) 'Unmanned' followed by the aircraft type and registration number if applicable, e.g. "Unmanned Puma 205AV"

b) location of the aircraft with reference to a NAVAID, airport, or Visual reporting point

c) trajectory and speed or, if remaining in a localized area, the radius of that area

d) range of altitudes.

All operators should have a flight operations manual approved by a competent authority. At a minimum, the manual should include procedures and checklist information for pre-flight, in flight, post flight, emergency procedures, and limitations. The operations manual should also include information on aircraft systems and performance.

Notification to other potential users of the airspace and appropriate regulatory authorities should be issued with ample time for those operators/regulators to plan appropriately. Assure no simultaneous operations between UAS and manned aircraft are planned in same area.

The following should take place prior to operations:

a) file NOTAMs

b) notify local airspace users (in addition to NOTAM). Include at least:
   - date and time range
   - precise location
   - altitude range
   - UAS type and description (what to look for)
   - frequencies monitored and call sign
   - contact information to coordinate, deconflict and exchange other information.

All UAS operations should include a pre-flight brief.

The briefing should include at a minimum:

a) mission overview

b) hazards unique to the mission (including potential sources of interference)

c) check and brief applicable NOTAMs

d) FSS/ATC notifications

e) identify any special airspace and restrictions (i.e. VFR corridors, TFRs, MOAs etc.)

f) de-confliction plans for intruding aircraft

g) weather (current and forecast ceiling, visibility and winds)

h) mission altitude

i) lost link, divert and flight termination procedures

j) identification of any public or residential areas near flight path and privacy concerns

k) flight time and fuel/battery requirements

l) fuel reserves/minimum voltage requirements

m) frequencies to be used.

Flight termination. The intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination should be executed in the event that all other contingencies have been exhausted, and further flight of the UAS cannot be safely achieved, or other potential hazards exist that require immediate discontinuation of flight.

Lost link. The loss of command-and-control link contact with the remotely piloted aircraft such that the remote pilot can no longer manage the aircraft's flight.

Immediately prior to each launch, the PIC should:

a) perform a pre-flight inspection/checklist

b) visual inspection of airframe condition

c) run system diagnostics

d) conduct engine run test

e) check battery, sensors, etc.

f) verify communications with the visual observer(s) and confirm that there is no conflicting air traffic.

Observer. A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. Collision avoidance includes, but is not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness.
A **visual observer** (VO) is a trained person who assists the UAS pilot by visual means in the duties associated with collision avoidance. A VO includes the OPA pilot when the OPA is being operated as a UAS.

The use of cell phones and other electronic devices during flight operations should be restricted to communications pertinent to the operational control of the UAS and any required communications with Air Traffic Control. Cell phones should not be used as the primary means of communications between visual observers and pilots.

All UAS operations should be conducted with procedures equivalent to sterile cockpit procedures during critical phases of flight. These include taxi and ground operations involving aircraft movement, take-off and landing, as well as all other flight operations in which safety or mission accomplishment might be compromised by distractions.

Lost link procedures

a) There are many acceptable approaches to satisfy lost link requirements. The intent of any lost link procedure is to ensure airborne operations remain predictable.

b) Lost link procedures should conform to any regulatory requirements and the lost link solution will need to comply with the last Air Traffic Control (ATC) clearance if applicable.

c) The appropriate ATC facility should be notified immediately if applicable.

d) Lost link procedures should avoid flight over any populated areas and hazards, as well as any frequently travelled flight paths.

e) The time and duration of each lost link event should be recorded by the operator and reported through the incident reporting process.

f) The designated return site should be clear of any personnel and hazards in the event of an immediate lost link return to base and landing.

3 Maintenance

A maintenance program should be in place to ensure the airworthiness of any UAS being utilized. Maintenance should be performed in accordance with manufacturer recommendations and only by properly trained and certified personnel. This program should comply with all governing regulations and policy.

The program should, at a minimum:

a) have a maintenance policy and a procedures manual approved by a relevant authority

b) be accepted by the UAS manufacturer

c) include a pre-flight and post flight inspection of the vehicle and have an associated logbook to track inspections

d) include a pre-flight and post flight inspection of the ground control station

e) incorporate a logbook to track flight hours and any inspection replacement times and life limited items (i.e. batteries, rotors)

f) software and hardware changes should be documented as a part of the maintenance procedures

g) maintain a record of malfunctions (i.e. loss of link), anomalies and damaged parts

h) maintenance training and evaluation program for each operated system

i) a quality assurance (QA) program should be utilized as a part of the overall safety management system (SMS)

j) include both field and depot level maintenance intervals.

It is highly recommended that all UAS operators provide the following information:

a) an Airworthiness program

b) a maintenance training program

c) any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation

d) a process to report any applicable data relating to the operation and maintenance of the UAS.

A minimum essential subsystem list (MESL) or similar list should be established for the entire system.

The MESLs lay the ground work for reporting the status of aircraft, ground control station and communications link availability. They list the minimum essential systems and subsystems that should work on an aircraft, ground control station and communications.

The MESL should include required equipment necessary for the specific mission and can include items such as ground control stations, sensors, back-up power supplies, aircraft lighting systems, transponder, back-up antennas, etc.

4 Training

UAS pilots should meet applicable local civil aviation authority qualifications, training and testing requirements for each class or type of UAS they will operate. The qualifications should be appropriate and as required for the UAS type.

All operators should have a training program to verify the air crew and observers meet the applicable requirements of the governing aviation regulator. The training program should be appropriate for each aircrew role, the environment and mission the operator is expected to perform.

The training program at a minimum should cover currency, evaluation, emergency procedure proficiency, systems knowledge and specialized tasks.

Training requirements should exist for the specific UAS over 55 pounds maximum takeoff weight (MTOW). Training programs on UAS under 55 pounds MTOW can be designed for similar types of systems (i.e. quadcopters under five pounds).

All training programs should conform to, or be consistent with, manufacturer's recommended training programs.

5 Communications

The communications control links are essential with all UAS operations. UAS should be operated in a reliable radio frequency environment that minimizes the probability of lost link and Radio Frequency (RF) interference with nearby systems.

UAS operators should have a valid communications plan that considers:

a) every effort is made to ensure positive control of the UAS at all times

b) a spectrum or RAIM analysis to determine frequency strength, integrity, and areas of possible interference prior to UAS operations. The UAS should be operated in strict compliance with all provisions and conditions contained within the spectrum analysis assigned and authorized

c) at a minimum, sources of possible radio frequency (RF) interference such as microwave antennas and high voltage lines should be identified and assessed prior to commencing operations

d) encryption of all command and return links when possible, or when sensitive information is being collected

e) all frequencies used to support safety-critical UAS functionality have been coordinated and licensed in accordance with the appropriate licensing regime

f) quick access to back-up ground control systems

g) immediate availability of secondary power supplies for the GCS and all antennas

h) safe recovery of the vehicle in the event of loss of link.

6 Hazard identification and safety

The UAS operator should have in place a Safety Management System (SMS) that is consistent with AMG 590-B, *Safety Management System, Quality and Emergency Response* [3].

The UAS operators should have an incident reporting system that tracks and reports all mishaps, potential mishaps, control link events, and near misses. This system should provide for analysis and improvements made as a part of the operator's Safety Management System (SMS). All mishaps, incidents and anomalies should be tracked and reported to the respective entity's aviation advisor and civilian aviation authorities when necessary.

Appropriate air traffic control should be immediately notified in the event of any emergency, loss of command link, loss of visual contact, or any other malfunction that would impact safety or operations.

All UAS operators should be equipped with any specialized equipment that may be required in the event of a mishap. For example, some composite material may require specific handling and equipment when the integrity of the composite is compromised.

Consideration should be given towards using UAS with redundant controls, automatic flight termination and/or flight recovery systems when operating near populated areas or sensitive infrastructure.

The UAS operator should have an established hazard register and hazard identification process. A hazard analysis should be completed prior to beginning flight operations in a new location, or when a new UAS is employed at an existing location. All risks should be evaluated according to a Risk Assessment Matrix (RAM), and the results of any risk controls should be evaluated through a Gap Analysis process.

Crew rest and crew mission day requirements, including consecutive days worked should be consistent with section 1.6 [Flight and duty times] of AMG 590-D, *Aircraft operations* [4] and compliant with applicable regulatory requirements. No PIC or reserve pilot should be at the controls of an UAS for more than eight (8) hours in one day to include no longer than three (3) hours in succession. UAS crews should have the opportunity of no less than twelve (12) hours of uninterrupted rest prior to flight operations.

UAS service providers should have a comprehensive aircrew fatigue management program as a part of their Safety Management Systems.

7 Emergency Response Planning

A formal emergency response plan should be in place for all flight operations.

An incident response checklist, approved as part of the flight operations manual, should be followed in the event of an incident or accident.

8 Battery handling

All UAS operators should have a battery safety program that includes:

a) documentation with appropriate Safety Data Sheets included in the aircraft flight manual, battery tracking systems and battery log books

b) battery storage plans that include storage and charging in fire proof containers

c) battery inspection procedures and requirements

d) procedures for thermal runaway, determination of battery pack capacity

e) recommended procedures for safe transportation of the batteries that are compliant with applicable regulations and work site requirements.

References

[1] International Civil Aviation Organization (ICAO). ICAO Circular 328. AN/190. *Unmanned Aircraft Systems (UAS)*. 2011. http://www.icao.int

[2] RTCA. DO-304, *Guidance Material and Considerations for Unmanned Aircraft Systems*. 2007. http://www.rtca.org

[3] IOGP. Report 590, Aircraft Management Guidelines (AMG). Module 590-B, *Safety Management System, Quality and Emergency Response.*

[4] IOGP. Report 590, Aircraft Management Guidelines (AMG). Module 590-D, *Aircraft operations.*

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The Aircraft Management Guidelines (AMG) provides recommended common guidance for the safe, effective and efficient management of all aviation operations. It is based on best practices developed in collaboration with the oil and gas offshore transport/aviation industry. Following the AMG will minimize risk in the management of aviation.

This report provides a ready reference for the management of aviation. It covers operations from the conceptual phase onwards. In so doing, it addresses the factors to be taken into account when contemplating aircraft operations, the tendering and contractual process, the setting up of support facilities and the expectations required of our contractors.