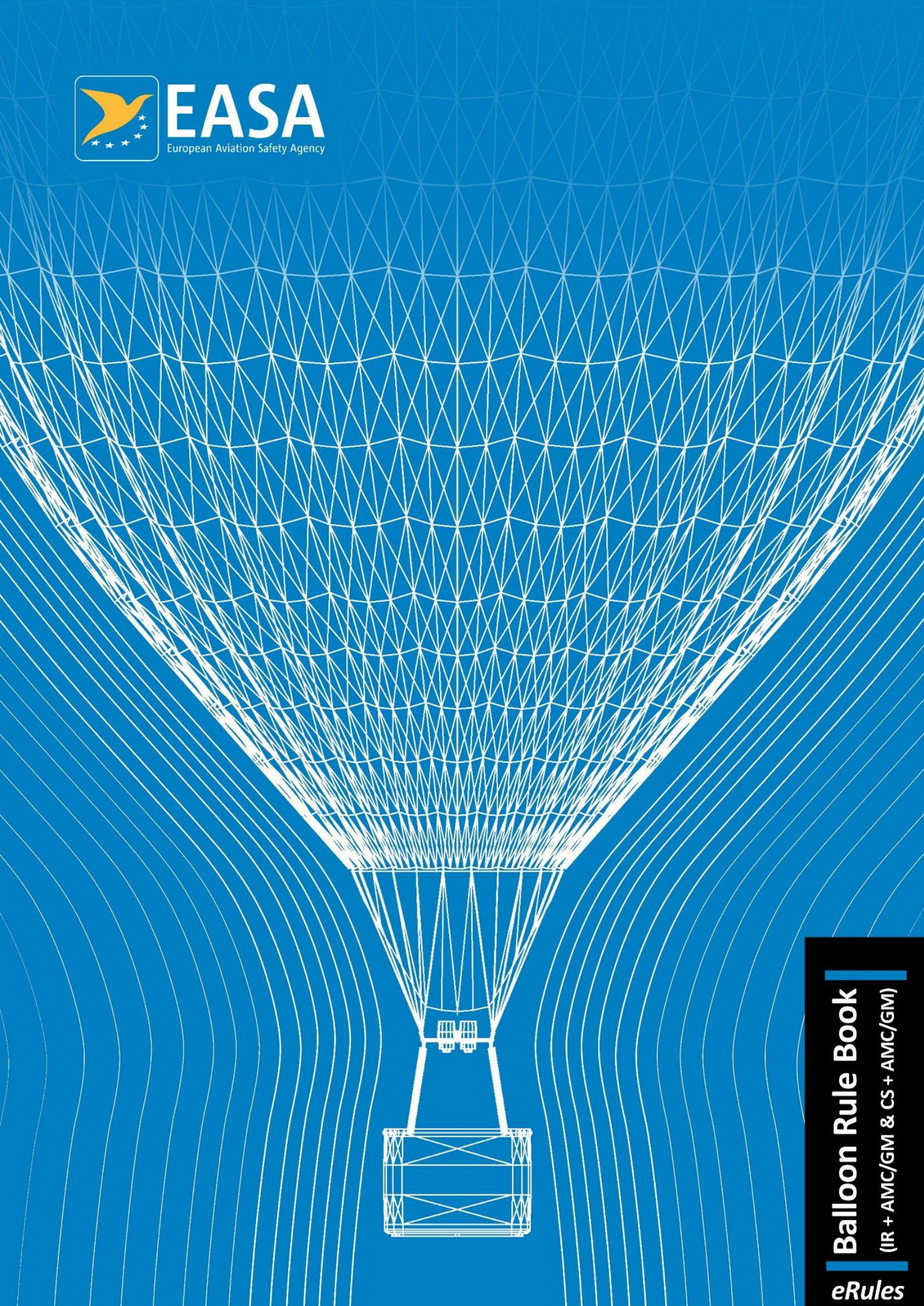




**EASA**

European Aviation Safety Agency



**Balloon Rule Book**  
(IR + AMC/GM & CS + AMC/GM)

**eRules**



# Balloon Rule Book

## Easy Access Rules

### **EASA eRules: aviation rules for the 21st century**

Rules and regulations are the core of the European Union civil aviation system. The aim of the **EASA eRules** project is to make them **accessible** in an efficient and reliable way to stakeholders.

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Published March 2018<sup>1</sup>

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This version is issued by the European Aviation Safety Agency (EASA) in order to provide its stakeholders with an updated and easy-to-read publication related to balloons. It has been prepared by putting together the officially published regulations with the related acceptable means of compliance and guidance material (including the amendments) adopted so far and certification specifications and acceptable means of compliance and guidance material. However, this is not an official publication and EASA accepts no liability for damage of any kind resulting from the risks inherent in the use of this document.

## NOTE FROM THE EDITOR

The content of this document is arranged as follows: the cover regulation (recitals and articles) of the implementing rule (IR) appear first, then the IR annex points, followed by the related acceptable means of compliance (AMC) and guidance material (GM) paragraph(s).

In case of certification specifications (CS), a CS paragraph is followed by the related AMC and GM paragraph.

All elements (i.e. cover regulation, IRs, AMC, CS, and GM) are colour-coded and can be identified according to the illustration below. The Commission regulation or EASA Executive Director (ED) decision through which the point or paragraph was introduced or last amended is indicated below the point or paragraph title(s) *in italics*.

|                                        |                              |
|----------------------------------------|------------------------------|
| <u><b>Cover regulation article</b></u> | <i>Commission regulation</i> |
| <b>Implementing rule annex</b>         | <i>Commission regulation</i> |
| <b>Certification specification</b>     | <i>ED decision</i>           |
| <b>Acceptable means of compliance</b>  | <i>ED decision</i>           |
| <b>Guidance material</b>               | <i>ED decision</i>           |

This document will be updated regularly to incorporate further amendments.

The format of this document has been adjusted to make it user-friendly and for reference purposes. Any comments should be sent to [erules@easa.europa.eu](mailto:erules@easa.europa.eu).

## INCORPORATED AMENDMENTS

### IMPLEMENTING RULES (IRs) (COMMISSION REGULATIONS)

| Incorporated Commission Regulation       | Affected Part                                | Regulation amendment | Applicability date <sup>1</sup> |
|------------------------------------------|----------------------------------------------|----------------------|---------------------------------|
| <a href="#">Regulation (EU) 2018/395</a> | Annex I — Definitions (Part-DEF)             | Initial issue        | 8/4/2019                        |
|                                          | Annex II — Balloon air operations (Part-BOP) |                      |                                 |

### AMC/GM TO IR (ED DECISIONS)

| Incorporated ED Decision               | Affected AMC/GM                                                                                            | Issue/ Amendment No | Applicability date |
|----------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------|--------------------|
| <a href="#">ED Decision 2018/004/R</a> | Annex I — AMC and GM to Articles of Commission Regulation (EU) 2018/395                                    | Initial issue       | 8/4/2019           |
|                                        | Annex II — AMC and GM to Annex II Balloon Air Operations (Part-BOP) to Commission Regulation (EU) 2018/395 |                     |                    |

### CS/GM (ED DECISIONS)

| Incorporated ED Decision               | CS/AMC Issue No, Amendment No | Applicability date |
|----------------------------------------|-------------------------------|--------------------|
| <a href="#">ED Decision 2011/012/R</a> | CS-31GB/ Initial issue        | 12/12/2011         |
| <a href="#">ED Decision 2011/013/R</a> | CS-31HB/ Amendment 1          | 12/12/2011         |
| <a href="#">ED Decision 2013/011/R</a> | CS-31TGB/ Initial issue       | 1/7/2013           |

*Note: To access the official source documents, please use the links provided above.*

<sup>1</sup> This date is the earliest applicability date for this regulation. Some provisions of the regulation may be applicable at a later date. Besides, there may be some opt-out filed by the Member States.

## EASY ACCESS RULES

| Title                                                                                                             | Affected Parts      | Revision date |
|-------------------------------------------------------------------------------------------------------------------|---------------------|---------------|
| <a href="#">Easy Access Rules for Continuing Airworthiness (Regulation (EU) No 1321/2014)</a>                     | Annex I (Part-M)    | June 2017     |
|                                                                                                                   | Annex II (Part-145) |               |
|                                                                                                                   | Annex III (Part-66) |               |
|                                                                                                                   | Annex IV (Part-147) |               |
|                                                                                                                   | Annex Va (Part-T)   |               |
| <a href="#">Easy Access Rules for Airworthiness and Environmental Certification (Regulation (EU) No 748/2012)</a> | Part-21             | February 2018 |
| <a href="#">Easy Access Rules for Part-FCL</a>                                                                    | Part-FCL            | June 2016     |

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# CHAPTER 1 — AIR OPERATIONS

## COVER REGULATION

*Regulation (EU) 2018/395*

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to [Regulation \(EC\) No 216/2008](#) of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC<sup>1</sup>, and in particular Article 8(5) thereof,

Whereas:

- (1) The Commission is to adopt the necessary implementing rules for establishing the conditions for the safe operation of balloons in accordance with [Regulation \(EC\) No 216/2008](#), where such aircraft meet the conditions specified in points (b) and (c) of Article 4(1) of that Regulation.
- (2) In light of the specific nature of operations with balloons, there is a need for dedicated operational rules, laid down in a self-standing Regulation. Those rules should be based on the general rules for air operations laid down in [Commission Regulation \(EU\) No 965/2012](#)<sup>2</sup>, but they should be restructured and simplified, so as to ensure that they are proportionate and founded on a risk-based approach, whilst ensuring that balloon operations are carried out safely.
- (3) The specific rules for air operations with balloons should not extend, however, to the requirements in respect of oversight of air operations by the competent authorities of the Member States, as those requirements are not specific to any particular air operation activity but apply horizontally in respect of all such activities. As regards oversight, the requirements laid down in Article 3 of [Commission Regulation \(EU\) No 965/2012](#) and Annex II to that Regulation should therefore continue to apply also with respect to air operations with balloons.
- (4) In the interest of safety and with a view to ensuring compliance with the essential requirements laid down in Annex IV to [Regulation \(EC\) No 216/2008](#), all operators of balloons covered by this Regulation, with the exception of design or production organisations performing certain operations, shall be subject to a set of basic requirements.
- (5) In order to provide additional protection for balloon passengers, provision should be made for certain additional requirements for operators engaged in commercial operations with balloons which should apply in addition to the basic requirements.
- (6) Those additional requirements should take account of the less complex nature of commercial operations with balloons as compared to other forms of commercial aviation, be proportionate and founded on a risk-based approach. Therefore, it is appropriate to replace the requirement of a certificate for commercial operations set out in Article 8(2) of [Regulation \(EC\) No 216/2008](#) by a requirement to make a prior declaration to the competent authority and to lay down the detailed rules for making such declarations as well as certain other additional requirements.

<sup>1</sup> OJ L 79, 19.3.2008, p. 1.

<sup>2</sup> Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

- (7) However, considering the comparatively low level of complexity and in light of a risk-based approach, operators engaged in certain commercial operations with balloons should be exempted from the requirement of certification and from those additional requirements, including the requirement of making a prior declaration. They should instead only be subject to the basic requirements set out in this Regulation which apply to all air operations with balloons covered by this Regulation.
- (8) In order to ensure a smooth transition and to avoid as much as possible any disruptions when introducing the new, specific regime for balloon operations laid down in this Regulation, any certificates, authorisations and approvals issued to operators of balloons in accordance with the rules applicable prior to the date of application of this Regulation should continue to be valid and be deemed to constitute a declaration made in accordance with this Regulation for a limited time period. After the expiry of that time period, all operators engaged in commercial operations with balloons should make a declaration in accordance with the provisions of this Regulation.
- (9) In order to ensure a smooth transition and to give all parties concerned sufficient time to prepare for the application of that new regime, this Regulation should only apply from an appropriate later date.
- (10) The Agency prepared draft implementing rules and submitted them as an opinion<sup>1</sup> to the Commission in accordance with point (b) of Article 17(2) and Article 19(1) of [Regulation \(EC\) No 216/2008](#).
- (11) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 65 of [Regulation \(EC\) No 216/2008](#),

HAS ADOPTED THIS REGULATION:

### **Article 1 Subject matter and scope**

*Regulation (EU) 2018/395*

1. This Regulation lays down detailed rules for air operations with balloons, where such aircraft meet the conditions laid down in points (b) and (c) of Article 4(1) of [Regulation \(EC\) No 216/2008](#).
2. This Regulation does not apply to air operations with tethered gas balloons.

### **Article 2 Definitions**

*Regulation (EU) 2018/395*

For the purposes of this Regulation, the following definitions shall apply:

- (1) 'balloon' means a manned lighter-than-air aircraft which is not power-driven and sustains flight through the use of either a lighter-than-air gas or an airborne heater, including gas balloons, hot-air balloons, mixed balloons and, although power-driven, hot-air airships;
- (2) 'gas balloon' means a free balloon that derives its lift from a lighter-than-air gas;
- (3) 'tethered gas balloon' means a gas balloon with a tether system that continuously anchors the balloon to a fixed point during operation;

<sup>11</sup> Opinion No 01/2016 of the European Aviation Safety Agency of 6 January 2016 for a Commission Regulation on the revision of the European operational rules for balloons.

- (4) 'free balloon' means a balloon that is not continuously anchored to a fixed point during operation;
- (5) 'hot-air balloon' means a free balloon that derives its lift from heated air;
- (6) 'mixed balloon' means a free balloon that derives its lift from a combination of heated air and a lighter-than-air, non-flammable gas;
- (7) 'hot-air airship' means a power-driven hot-air balloon, whereby the engine does not create any portion of lift;
- (8) 'competition flight' means any air operation with a balloon performed for the purposes of participating in air races or contests, including practising for such an operation and flying to and from air races or contests;
- (9) 'flying display' means any air operation with a balloon performed for the purposes of providing an exhibition or entertainment at an advertised event open to the public, including practising for such an operation and flying to and from the advertised event;
- (10) 'introductory flight' means any air operation against remuneration or other valuable consideration consisting of an air tour of short duration for the purpose of attracting new trainees or new members, performed either by a training organisation approved in accordance with [Commission Regulation \(EU\) No 1178/2011](#)<sup>1</sup> or by an organisation created with the aim of promoting aerial sport or leisure aviation;
- (11) 'principal place of business' means the head office or registered office of the operator of the balloon within which the principal financial functions and operational control of the activities referred to in this Regulation are exercised;
- (12) 'dry lease agreement' means an agreement between undertakings pursuant to which the balloon is operated under the responsibility of the lessee.

### **Article 3 Air operations**

*Regulation (EU) 2018/395*

1. Operators of balloons shall operate the balloon in accordance with the requirements set out in [Subpart BAS](#) of Annex II.

However, the first subparagraph shall not apply to design or production organisations which are compliant with Articles 8 and 9, respectively, of [Commission Regulation \(EU\) No 748/2012](#)<sup>2</sup> and which operate the balloon, within the scope of their privileges, for the purposes of the introduction or modification of balloon types.

2. By way of derogation from Article 8(2) of [Regulation \(EC\) No 216/2008](#), the requirement of certification laid down therein shall not apply to operators engaged in commercial operations with balloons.

Those operators shall only be entitled to engage in such commercial operations after having declared to the competent authority their capacity and means to discharge the responsibilities associated with the operation of the balloon. They shall make that declaration and operate the

<sup>1</sup> Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1).

<sup>2</sup> Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1).

balloon, in addition to the requirements set out in [Subpart BAS](#), in accordance with the requirements set out in [Subpart ADD](#) of Annex II.

However, the second subparagraph shall not apply to operators engaged in the following operations with balloons:

- (a) cost-shared operations by four individuals or less, including the pilot, provided that the direct costs of the flight of the balloon and a proportionate part of the annual costs incurred for the storage, insurance and maintenance of the balloon are shared by all those individuals;
- (b) competition flights or flying displays, provided that the remuneration or any other valuable consideration for such flights is limited to the recovery of the direct costs of the flight of the balloon and a proportionate part of the annual costs incurred for the storage, insurance and maintenance of the balloon and that any prizes gained do not exceed the value specified by the competent authority;
- (c) introductory flights with four individuals or less, including the pilot, and flights for the purposes of parachute dropping, performed either by a training organisation which has its principal place of business in a Member State and which has been approved in accordance with [Regulation \(EU\) No 1178/2011](#) or by an organisation created for the purposes of promoting aerial sport or leisure aviation, provided that the organisation operates the balloon on the basis of either ownership or a dry lease agreement, that the flight does not generate profits distributed outside of the organisation and that such flights represent only a marginal activity of the organisation;
- (d) training flights, performed by a training organisation which has its principal place of business in a Member State and which has been approved in accordance with [Regulation \(EU\) No 1178/2011](#).

## GM1 Article 3(2)(a);(b) Air operations

ED Decision 2018/004/R

### DIRECT COST

‘Direct cost’ means the cost directly incurred in relation to a flight, e.g. fuel costs of the balloon and the retrieve vehicle directly incurred in relation to a flight, take-off and landing fees, and rental fee for a balloon. There is no element of profit or salary for the pilot.

## GM2 Article 3(2)(a);(b) Air operations

ED Decision 2018/004/R

### ANNUAL COST

‘Annual cost’ means the cost of the balloon over a period of one calendar year. There is no element of profit or salary for the pilot.

## GM1 Article 3(2)(c) Air operations

ED Decision 2018/004/R

### ORGANISATION CREATED FOR THE PURPOSES OF PROMOTING AERIAL SPORT OR LEISURE AVIATION

An 'organisation created for the purposes of promoting aerial sport or leisure aviation' means a non-profit organisation established under applicable national law for the sole purpose of gathering persons sharing the same interest in general aviation to fly for pleasure or to conduct parachute jumping. The organisation should have balloons available.

## GM2 Article 3(2)(c) Air operations

ED Decision 2018/004/R

### MARGINAL ACTIVITY

The term 'marginal activity' should be understood as representing a very minor part of the overall activity of an organisation, mainly for the purpose of promoting itself or attracting new students or members. An organisation intending to offer such flights as a regular business activity is not considered to meet the condition of marginal activity. Also, flights organised with the sole intent to generate income for the organisation are not considered to be a marginal activity.

## Article 4 Transitional provisions

Regulation (EU) 2018/395

Certificates, authorisations and approvals issued to operators of balloons by Member States before 8 April 2019 in accordance with [Regulation \(EU\) No 965/2012](#) or in accordance with provisions of national law compliant with Article 10(2), (3) and (5)(b) of [Regulation \(EU\) No 965/2012](#) shall remain valid until 8 October 2019.

Until 8 October 2019, any reference made in this Regulation to a declaration shall also be understood as a reference to the certificates, authorisations or approvals issued by Member States before 8 April 2019.

## Article 5 Entry into force and application

Regulation (EU) 2018/395

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 8 April 2019.

Regulation (EU) 2018/395

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 13 March 2018.

*For the Commission*

*The President*

*Jean-Claude JUNCKER*

## ANNEX I

### DEFINITIONS [PART-DEF]

*Regulation (EU) 2018/395*

For the purposes of Annex II, the following definitions shall apply:

1. 'acceptable means of compliance (AMC)' means non-binding standards adopted by the Agency to illustrate means to establish compliance with [Regulation \(EC\) No 216/2008](#) and its implementing rules;
2. 'alternative means of compliance (AltMoC)' means those means that propose an alternative to an existing AMC or those that propose new means to establish compliance with [Regulation \(EC\) No 216/2008](#) and its implementing rules for which no associated AMC have been adopted by the Agency;
3. 'pilot-in-command' means the pilot designated as being in command and charged with the safe conduct of the flight;
4. 'crew member' means a person assigned by an operator to perform duties on board the balloon or, where the duties are directly related to the operation of the balloon, on the ground;
5. 'flight crew member' means a licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period;
6. 'psychoactive substances' means alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens and volatile solvents, excluding coffee and tobacco;
7. 'accident' means an occurrence associated with the operation of a balloon which takes place between the moment of the commencement of the inflation of the balloon and the moment of complete deflation of the balloon, in which:
  - (a) a person suffers fatal or serious injuries as a result of being in the balloon or as a result of direct contact with any part of the balloon, including parts which have become detached from the balloon, but excluding any injuries arising from natural causes or which are self-inflicted or inflicted by other persons;
  - (b) the balloon sustains damage or structural failure which adversely affects its structural strength, performance or flight characteristics and requires major repair or replacement of the affected component; or
  - (c) the balloon is missing or is completely inaccessible;
8. 'incident' means an occurrence, other than an accident, associated with the operation of a balloon which affects or could affect the safety of its operation;
9. 'serious incident' means an occurrence associated with the operation of the balloon which takes place between the moment of the commencement of the inflation of the balloon and the moment of complete deflation of the balloon, in which there was a high probability of an accident;
10. 'critical phases of flight' means take-off, final approach, missed approach, landing and any other phases of a flight which the pilot-in-command determines as critical for the safe operation of the balloon;



11. 'aircraft flight manual (AFM)' means the document containing the applicable and approved operating limitations and information with respect to the balloon;
12. 'dangerous goods' means articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the technical instructions or which are to be classified as such in accordance with those instructions;
13. 'technical instructions' means the latest applicable edition of the 'Technical instructions for the safe transport of dangerous goods by air', including the supplement and any addenda, published by ICAO in document 9284-AN/905;
14. 'operating site' means a site selected by the pilot-in-command or the operator for landing, take-off or external load operations;
15. 'refuelling' means the refilling of fuel cylinders or fuel tanks from an external source, excluding the replacement of fuel cylinders;
16. 'night' means the period between the end of evening civil twilight and the beginning of morning civil twilight. 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;
17. 'balloon specialised operation' means any operation, which can be commercial or non-commercial, with a balloon the main purpose of which is not the carriage of passengers for sightseeing or experience flights, but parachute operations, hang-gliding dropping, flying displays, competition flights or similar specialised activities;
18. 'traffic load' means the total mass of passengers, baggage and carry-on specialist equipment;
19. 'balloon empty mass' means the mass determined by weighing the balloon with all the installed equipment as specified in the AFM;
20. 'wet lease agreement' means an agreement between operators pursuant to which the balloon is operated under the responsibility of the lessor;
21. 'commercial passenger ballooning' (CPB) means a form of commercial air transport operation with a balloon whereby passengers are carried on sightseeing or experience flights for remuneration or other valuable consideration;
22. 'commercial air transport (CAT) operation' means an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration.

## ANNEX II — BALLOON AIR OPERATIONS [PART-BOP]

### SUBPART BAS — BASIC OPERATIONAL REQUIREMENTS

#### SECTION 1 — GENERAL REQUIREMENTS

##### BOP.BAS.001 Scope

*Regulation (EU) 2018/395*

In accordance with [Article 3](#), this Subpart establishes the requirements to be met by any operator of balloons, other than the design or production organisations referred to in the second subparagraph of [Article 3\(1\)](#).

##### AMC1 BOP.BAS.001 Scope

*ED Decision 2018/004/R*

###### AERIAL ADVERTISING FLIGHT

An aerial advertising flight, displaying a logotype or an advertisement on the balloon, should only be considered a commercial operation, when:

- (a) especially conducted at a specific time and for an advertising purpose; and
- (b) conducted in return for remuneration or other valuable consideration from the principal, with or without the existence of a contract.

##### GM1 BOP.BAS.001 Scope

*ED Decision 2018/004/R*

###### MIXED BALLOONS

Mixed balloons are operated in accordance with the requirements for hot-air balloons, unless otherwise specified.

##### BOP.BAS.005 Competent authority

*Regulation (EU) 2018/395*

The competent authority shall be the authority designated by the Member State where the operator has its principal place of business or, where the operator has no principal place of business, the place where the operator is established or resides. That authority shall be subject to the requirements of Article 3 of [Regulation \(EU\) No 965/2012](#) in accordance with Article 1(7) of that Regulation.

##### BOP.BAS.010 Demonstration of compliance

*Regulation (EU) 2018/395*

- (a) An operator shall, when so requested by the competent authority which is verifying continued compliance by the operator in accordance with point ARO.GEN.300(a)(2) of Annex II to [Regulation \(EU\) No 965/2012](#), demonstrate compliance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation.
- (b) The operator shall use either of the following means to demonstrate such compliance:

- (1) acceptable means of compliance (AMC);
- (2) alternative means of compliance (AltMoC).

## BOP.BAS.015 Introductory flights

*Regulation (EU) 2018/395*

Introductory flights shall be:

- (a) operated under visual flight rules (VFR) by day; and
- (b) overseen as regards their safety by a person who has been nominated by the organisation performing the introductory flights.

## BOP.BAS.020 Immediate reaction to a safety problem

*Regulation (EU) 2018/395*

The operator shall implement:

- (a) safety measures mandated by the competent authority in accordance with point (c) of point ARO.GEN.135 of Annex II to [Regulation \(EU\) No 965/2012](#); and
- (b) airworthiness directives and other mandatory information issued by the Agency in accordance with point (j) of Article 20(1) of [Regulation \(EC\) No 216/2008](#).

## BOP.BAS.025 Designation as pilot-in-command

*Regulation (EU) 2018/395*

The operator shall designate a pilot-in-command who is qualified to act as pilot-in-command in accordance with Annex I to [Regulation \(EU\) No 1178/2011](#).

## BOP.BAS.030 Responsibilities of the pilot-in-command

*Regulation (EU) 2018/395*

- (a) The pilot-in-command shall:
  - (1) be responsible for the safety of the balloon and of any person or property carried therein during balloon operations;
  - (2) be responsible for the initiation, continuation or termination of a flight in the interest of safety;
  - (3) ensure that all applicable operational procedures and checklists are complied with;
  - (4) only commence a flight if he or she is satisfied that all operational limitations are complied with, as follows:
    - (i) the balloon is airworthy;
    - (ii) the balloon is duly registered;
    - (iii) instruments and equipment required for the execution of the flight are carried on board the balloon and are operative;
    - (iv) the mass of the balloon is such that the flight can be conducted within the limits defined by the AFM;
    - (v) all equipment and baggage are properly loaded and secured; and

- (vi) the operating limitations of the balloon as specified in the AFM will not be exceeded at any time during the flight;
  - (5) ensure that the pre-flight inspection has been carried out as required by Annex I to [Commission Regulation \(EU\) No 1321/2014](#)<sup>1</sup>;
  - (6) be responsible for the pre-flight briefing of persons assisting in the inflation and deflation of the envelope;
  - (7) ensure that persons assisting in the inflation and deflation of the envelope wear appropriate protective clothing;
  - (8) be satisfied that relevant emergency equipment remains easily accessible for immediate use;
  - (9) ensure that no person is smoking on board or within the direct vicinity of the balloon;
  - (10) not allow a person to be carried in the balloon who appears to be under the influence of psychoactive substances to the extent that the safety of the balloon or of any person or property carried therein is likely to be endangered;
  - (11) remain during flight in control of the balloon at all times except if another pilot is taking the controls;
  - (12) take any action in an emergency situation that requires immediate decision and action which he or she considers necessary under the circumstances. In such cases he or she may deviate from rules, operational procedures and methods to the extent necessary in the interest of safety;
  - (13) not continue a flight beyond the nearest weather-permissible operating site when his or her capacity to perform his or her duties is significantly reduced because of sickness, fatigue, lack of oxygen or any other cause;
  - (14) record utilisation data and all known or suspected defects in the balloon at the termination of the flight, or series of flights, in the balloon logbook;
  - (15) notify the safety investigation authority of the State in the territory of which the occurrence took place and the emergency services of that State without delay by the quickest available means of any serious incident or accident involving the balloon;
  - (16) submit a report of an act of unlawful interference without delay to the competent authority and inform the local authority designated by the State in the territory of which the unlawful interference took place; and
  - (17) report to the appropriate air traffic services (ATS) unit, without delay, any hazardous weather or flight conditions encountered that are likely to affect the safety of other aircraft.
- (b) The pilot-in-command shall not perform duties on a balloon in one of the following situations:
- (1) when he or she is incapacitated from performing his or her duties by any cause, including injury, sickness, medication, fatigue or the effects of any psychoactive substance, or feels otherwise unfit;
  - (2) if applicable medical requirements are not fulfilled.

<sup>1</sup> Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks (OJ L 362, 17.12.2014, p. 1).

- (c) Whenever crew members are involved in the operation of the balloon, the pilot-in-command shall:
- (1) ensure that during critical phases of flight or whenever deemed necessary in the interest of safety, all crew members are at their assigned stations and do not perform any activities other than those required for the safe operation of the balloon;
  - (2) not commence a flight if any crew member is incapacitated from performing his or her duties by any cause, including injury, sickness, medication, fatigue or the effects of any psychoactive substance, or feels otherwise unfit;
  - (3) not continue a flight beyond the nearest weather-permissible operating site when any crew member's capacity to perform duties is significantly reduced because of sickness, fatigue or lack of oxygen or any other cause; and
  - (4) ensure that all crew members can communicate with each other in a common language.

## GM1 BOP.BAS.030 Responsibilities of the pilot-in-command

*ED Decision 2018/004/R*

### GENERAL

In accordance with the essential requirements for air operations, which are laid down in Annex IV to [Regulation \(EC\) No 216/2008](#)<sup>1</sup>, the pilot-in-command is responsible for the operation and safety of the balloon and for the safety of all passengers on board. This includes the following:

- (a) the safety of all passengers on board, as soon as he or she arrives on board until he or she leaves the balloon at the end of the flight; and
- (b) the operation and safety of the balloon from the moment the balloon is unloaded from the retrieve vehicle or trailer to the moment the balloon is reloaded, unless the preparation of the flight is delegated to a crew member.

## AMC1 BOP.BAS.030(a)(3) Responsibilities of the pilot-in-command

*ED Decision 2018/004/R*

### CHECKLISTS

- (a) The pilot-in-command should use the latest checklists provided by the manufacturer or the operator.
- (b) If checks conducted before take-off are suspended at any point, the pilot-in-command should restart them from a safe point prior to the interruption.

<sup>1</sup> Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

**GM1 BOP.BAS.030(a)(7) Responsibilities of the pilot-in-command**

ED Decision 2018/004/R

**PROTECTIVE CLOTHING**

Protective clothing includes:

- (a) long sleeves and trousers preferably made of natural fibres;
- (b) stout footwear; and
- (c) gloves.

**GM1 BOP.BAS.030(a)(14) Responsibilities of the pilot-in-command**

ED Decision 2018/004/R

**RECORDING UTILISATION DATA**

Where a balloon conducts a series of flights of short duration and is operated by the same pilot-in-command, the utilisation data for the series of flights may be recorded in the balloon logbook as a single entry.

**AMC1 BOP.BAS.030(a)(17) Responsibilities of the pilot-in-command**

ED Decision 2018/004/R

**REPORTING OF HAZARDOUS FLIGHT CONDITIONS**

- (a) These reports should include any detail which may be pertinent to the safety of other aircraft.
- (b) When unexpected meteorological conditions affecting other aircraft are encountered that, in the opinion of the pilot-in-command, may affect the safety of other aircraft operations, he or she should advise the appropriate air traffic services (ATS) unit as soon as practicable.

**AMC1 BOP.BAS.030(b)(1) & AMC1 BOP.BAS.040(b) Responsibilities of the pilot-in-command & responsibilities of crew members**

ED Decision 2018/004/R

**ALCOHOL CONSUMPTION**

The operator should issue instructions concerning the consumption of alcohol by the pilot-in-command and the crew members. The instructions should not be less restrictive than the following:

- (a) no alcohol should be consumed less than 8 hours prior to an operation;
- (b) the blood alcohol level should not exceed the lower of the national requirements or 0.2 grams of alcohol in 1 litre of blood at the start of an operation; and
- (c) no alcohol should be consumed during the operation.



## GM1 BOP.BAS.030(b)(1);(2) & GM1 BOP.BAS.040(b) Responsibilities of the pilot-in-command & responsibilities of crew members

*ED Decision 2018/004/R*

### PART-MED

Information on the effects of medication, psychoactive substances and other treatments can be found in Annex IV (Part-MED) to [Regulation \(EU\) No 1178/2011](#)<sup>1</sup>.

### BOP.BAS.035 Authority of the pilot-in-command

*Regulation (EU) 2018/395*

The pilot-in-command shall have the authority to:

- (a) give all commands and take any appropriate actions for the purpose of ensuring the safety of the balloon and of any person or property carried therein; and
- (b) refuse embarkation or carriage of any person or baggage that may represent a potential hazard to the safety of the balloon or of any person or property carried therein.

### BOP.BAS.040 Responsibilities of crew members

*Regulation (EU) 2018/395*

- (a) Any crew member shall be responsible for the proper execution of his or her duties in respect of the operation of the balloon.
- (b) Crew members shall not perform duties on a balloon when incapacitated by any cause, including injury, sickness, medication, fatigue or the effects of any psychoactive substance, or if he or she feels otherwise unfit.
- (c) Crew members shall report to the pilot-in-command both of the following:
  - (1) any fault, failure, malfunction or defect, which he or she believes may affect the airworthiness or safe operation of the balloon, including emergency systems;
  - (2) any incident.
- (d) Any flight crew member who undertakes duties for more than one operator shall:
  - (1) maintain his or her individual records regarding flight times and rest periods, if applicable; and
  - (2) provide each operator with the data needed to schedule activities in accordance with the applicable flight and duty time limitations and rest requirements.

<sup>1</sup> Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1).

## GM1 BOP.BAS.040 Responsibilities of crew members

ED Decision 2018/004/R

### DESIGNATION OF PERSONS AS CREW MEMBERS

- (a) The pilot-in-command or the operator may designate any person as a crew member provided that:
  - (1) the role, according to the reasonable expectation of the pilot-in-command or the operator, will enhance the safety of the flight or achieve an operational objective of the flight;
  - (2) the person, according to the reasonable expectation of the pilot-in-command or the operator, is capable of fulfilling the role;
  - (3) the person has been briefed on the role as a crew member and informed that he or she is crew, not a passenger; and
  - (4) the person agrees to the role as crew member.
- (b) Crew members are not considered to be passengers.
- (c) Crew members may be required, by specific provisions of this Regulation and other Implementing Rules, to hold licences, ratings or other personnel certificates to fulfil certain roles such as instructor or examiner, in certain circumstances.

## BOP.BAS.045 Compliance with laws, regulations and procedures

Regulation (EU) 2018/395

- (a) The pilot-in-command and all other crew members shall comply with the laws, regulations and procedures of those States where operations are conducted.
- (b) The pilot-in-command shall be familiar with the laws, regulations and procedures, pertinent to the performance of his or her duties, prescribed for the areas to be traversed, the operating sites to be used and the related air navigation facilities.

## BOP.BAS.050 Documents, manuals and information to be carried

Regulation (EU) 2018/395

- (a) All of the following documents, manuals and information shall be carried on each flight, as originals or copies:
  - (1) the operating limitations, normal, abnormal and emergency procedures and other relevant information specific to the balloon's operating characteristics;
  - (2) details of the filed ATS flight plan, when required in accordance with Section 4 of the Annex to Commission Implementing Regulation (EU) No 923/2012<sup>1</sup>;
  - (3) current and suitable aeronautical charts for the area of the intended flight.
- (b) All of the following documents, manuals and information shall be carried on each flight or shall be stowed in the retrieve vehicle, as originals or copies:
  - (1) the certificate of registration;

<sup>1</sup> Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.10.2012, p. 1).

- (2) the certificate of airworthiness, including the annexes;
  - (3) the AFM or equivalent document(s);
  - (4) the aircraft radio licence, where the balloon is equipped with radio communication equipment in accordance with point (a) of point [BOP.BAS.355](#);
  - (5) the third party liability insurance certificate(s);
  - (6) the balloon logbook or equivalent document(s);
  - (7) any other documentation that may be pertinent to the flight or is required by the State or States concerned with the flight.
- (c) When requested by the competent authority, the pilot-in-command or the operator shall make available to that authority the original documentation within the time period specified by the authority which shall not be less than 24 hours.

## GM1 BOP.BAS.050 Documents, manuals and information to be carried

*ED Decision 2018/004/R*

### GENERAL

- (a) In case of loss or theft of documents specified in BOP.BAS.050, the operation may continue until the balloon has landed. The operator provides replacement documentation within the shortest possible time frame.
- (b) The documents, manuals and information may be available in a form other than on printed paper. An electronic storage medium is acceptable if accessibility, usability and reliability is assured.

## AMC1 BOP.BAS.050(a)(1) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

### OPERATING LIMITATIONS, NORMAL, ABNORMAL AND EMERGENCY PROCEDURES

The operating limitations, as well as normal, abnormal and emergency procedures should be available to the pilot during the operation by providing the specific sections of the aircraft flight manual (AFM) or by other means that effectively accomplish the purpose.

## AMC1 BOP.BAS.050(a)(3) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

### CURRENT AND SUITABLE AERONAUTICAL CHARTS

- (a) The aeronautical charts carried should contain data appropriate to the applicable air traffic regulations, rules of the air, flight altitudes, area, route, and nature of the operation. Due consideration should be given to the carriage of textual and graphic representations of:
  - (1) aeronautical data, including, as appropriate for the nature of the operation:
    - (i) airspace structure;

- (ii) communication frequencies;
  - (iii) prohibited, restricted and danger areas;
  - (iv) sites of other relevant activities that may hazard the flight; and
- (2) topographical data, including terrain and obstacle data.
- (b) A combination of different charts and textual data may be used to provide adequate and current data.
- (c) The aeronautical data should be relevant for the current aeronautical information regulation and control (AIRAC) cycle.
- (d) The topographical data should be reasonably recent, as regards the nature of the planned operation.

### AMC1 BOP.BAS.050(b)(2) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

#### **CERTIFICATE OF AIRWORTHINESS**

The certificate of airworthiness should be a normal certificate of airworthiness, a restricted certificate of airworthiness, or a permit to fly issued in accordance with the applicable airworthiness requirements.

### GM1 BOP.BAS.050(b)(3) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

#### **AFM OR EQUIVALENT DOCUMENT**

‘AFM or equivalent document(s)’ means the flight manual for the balloon or other documents containing information required for the operation of the balloon within the terms of its certificate of airworthiness.

### GM1 BOP.BAS.050(b)(6) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

#### **BALLOON LOGBOOK OR EQUIVALENT DOCUMENT**

‘Balloon logbook or equivalent document(s)’ means that the required information may be recorded in documentation other than a logbook, such as the operational flight plan or the balloon technical log.

### GM1 BOP.BAS.050(b)(7) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

#### **DOCUMENTS THAT MAY BE PERTINENT TO THE FLIGHT AND STATES CONCERNED WITH THE FLIGHT**

- (a) Any other documents that may be pertinent to the flight or are required by the States concerned with the flight may include, for example, forms to comply with reporting requirements.

- (b) The States concerned are those of origin, overflight and destination of the flight.

## BOP.BAS.055 Dangerous goods

Regulation (EU) 2018/395

- (a) The transport of dangerous goods on board the balloon shall be conducted in accordance with the requirements set out in Annex 18 to the Chicago Convention, as last amended and amplified by the technical instructions.
- (b) The pilot-in-command shall take all reasonable measures to prevent dangerous goods from being carried on board the balloon inadvertently.
- (c) Reasonable quantities of articles and substances that would otherwise be classified as dangerous goods and that are used to facilitate flight safety, where carriage on board the balloon is advisable to ensure their timely availability for operational purposes, shall be considered authorised under point 2.2.1(a) of Part 1 of the technical instructions, regardless of whether or not such articles and substances are required to be carried or intended to be used in connection with a particular flight. The pilot-in-command shall ensure that the packing and loading on board the balloon of those articles and substances is performed in such a way as to minimise the risks posed to crew members, passengers and the balloon during operation.
- (d) The pilot-in-command or, when the pilot-in-command is incapacitated, the operator shall report without delay any accidents or incidents involving dangerous goods to the safety investigation authority of the State in the territory of which the occurrence took place, the emergency services of that State, any other authority designated by that State and the competent authority.

## GM1 BOP.BAS.055 Dangerous goods

ED Decision 2018/004/R

### GENERAL

The carriage of dangerous goods is only permitted when:

- (a) they are not subject to the 'Technical instructions for the safe transport of dangerous goods by air', ICAO Doc 9284-AN/905, in accordance with Part 1 of those instructions. Following the technical instructions, articles and substances which would otherwise be classified as dangerous goods, but which are required on board the balloon in accordance with the pertinent airworthiness requirements or the requirements of this Annex, are permitted;
- (b) they are carried by crew members or passengers, or are in baggage, in accordance with Part 8 of the technical instructions; or
- (c) they are required on board the balloon for specialised purposes in accordance with the technical instructions.

## GM2 BOP.BAS.055 Dangerous goods

ED Decision 2018/004/R

### EXAMPLES

Dangerous goods include the following:

- (a) explosives (fireworks, flares, detonators, fuses, dynamite, ammunition and materials for fireworks in general);

- (b) compressed or refrigerated liquid, or dissolved gases (aerosols, self-defence sprays, camping gas, extinguishers, cryogenic liquids, bottles with cooling gases and compressed gas cylinders in general);
- (c) flammable liquids and solids (fuel, equipment containing fuel, adhesives, solvents, paint, petrol, varnish, torches, cigarette lighters and lighter refills);
- (d) substances that emit flammable gases in contact with water;
- (e) oxidisers and organic peroxides (oxygen generators and bleaching powder); and
- (f) substances liable to spontaneous combustion (strike-anywhere matches and phosphorous).

## **BOP.BAS.060 Release of dangerous goods**

*Regulation (EU) 2018/395*

- (a) The pilot-in-command shall not release dangerous goods when operating a balloon over congested areas of cities, towns or settlements or over an open-air assembly of persons.
- (b) Notwithstanding point (a), parachutists may exit the balloon for the purpose of parachute display over those congested areas or over that open-air assembly of persons whilst carrying smoke trail devices that were manufactured for that purpose.

## **BOP.BAS.065 Balloon logbook**

*Regulation (EU) 2018/395*

For each flight, or series of flights, particulars of the balloon, its crew and each journey shall be retained in the form of a balloon logbook or an equivalent document.

## **AMC1 BOP.BAS.065 Balloon logbook**

*ED Decision 2018/004/R*

### **GENERAL**

The balloon logbook, or equivalent, should include the following items, where applicable:

- (a) balloon nationality and registration;
- (b) date;
- (c) name(s) of flight crew member(s);
- (d) place of departure;
- (e) place of arrival;
- (f) time of departure;
- (g) time of arrival;
- (h) hours of flight;
- (i) type of operation;
- (j) incidents and observations, if any; and
- (k) signature of the pilot-in-command.



## GM1 BOP.BAS.065 Balloon logbook

*ED Decision 2018/004/R*

### **SERIES OF FLIGHTS**

- (a) 'Series of flights' means consecutive flights, which begin and end:
  - (1) within a 6-hour period;
  - (2) at the same operating site or remain within a local area; and
  - (3) with the same pilot-in-command of the balloon.
- (b) The term 'series of flights' is used to facilitate a single set of documentation.

## SECTION 2 — OPERATING PROCEDURES

### BOP.BAS.100 Use of operating sites

*Regulation (EU) 2018/395*

The pilot-in-command shall only use operating sites that are adequate for the type of balloon and operation concerned.

### BOP.BAS.105 Noise abatement procedures

*Regulation (EU) 2018/395*

The pilot-in-command shall take into account operating procedures to minimise the effect of heating-system noise, while ensuring however that safety has priority over noise abatement.

### BOP.BAS.110 Fuel and ballast supply and planning

*Regulation (EU) 2018/395*

The pilot-in-command shall only commence a flight if the reserve fuel or ballast carried on board the balloon is sufficient to ensure a safe landing.

### AMC1 BOP.BAS.110 Fuel and ballast supply and planning

*ED Decision 2018/004/R*

#### GENERAL

- (a) The pilot-in-command should only commence a flight if the reserve fuel or ballast is sufficient for 30 minutes of flight.
- (b) Notwithstanding (a), the pilot-in-command should only commence a flight if the reserve fuel (for the burner, and, in case of hot-air airships, also for the engine) or ballast is sufficient for 15 minutes of flight for:
  - (1) hot-air balloons equipped with a single fuel tank; and
  - (2) hot-air airships, when the flight is conducted in the vicinity of the operating site.
- (c) Fuel or ballast supply calculations should be based upon at least the following operating conditions under which the flight is to be conducted:
  - (1) data provided by the balloon manufacturer;
  - (2) anticipated masses;
  - (3) expected meteorological conditions; and
  - (4) air navigation services provider procedures and restrictions.

### BOP.BAS.115 Passenger briefing

*Regulation (EU) 2018/395*

The pilot-in-command shall ensure that before and, when appropriate, during the flight passengers are given a briefing on normal, abnormal and emergency procedures.

## AMC1 BOP.BAS.115 Passenger briefing

ED Decision 2018/004/R

### GENERAL

- (a) Passengers should be given a verbal briefing and demonstration about safety matters in such a way that the information is easily retained and applied during the landing and in the case of an emergency situation.
- (b) The briefing/demonstration should include the following items:
  - (1) safety in relation to ground equipment;
  - (2) use of internal handholds;
  - (3) wearing of suitable clothing;
  - (4) smoking regulations;
  - (5) in-flight use and stowage of personal belongings and baggage;
  - (6) importance to remain inside the basket at all times, particularly after landing;
  - (7) landing positions to be assumed to minimise the effect of the impact during landing;
  - (8) safe manoeuvring of the balloon on the ground after landing;
  - (9) use of oxygen-dispensing equipment, if applicable; and
  - (10) other emergency equipment provided for individual passenger use, if applicable.
- (c) Part or all of the verbal briefing may be provided additionally by a safety briefing card on which pictorial instructions indicate the correct landing position.
- (d) Before take-off, the correct landing position should be demonstrated.
- (e) Before commencing the landing phase, passengers should be required to practise the correct landing position.

## GM1 BOP.BAS.115 Passenger briefing

ED Decision 2018/004/R

### GENERAL

The pilot-in-command or a person designated by the operator is carrying out the passenger briefing.

## BOP.BAS.120 Carriage of special categories of passengers

Regulation (EU) 2018/395

The pilot-in-command shall ensure that persons requiring special conditions, assistance or devices when carried on board a balloon are carried under conditions that ensure the safety of the balloon and of any persons or property carried therein.

**AMC1 BOP.BAS.120 Carriage of special categories of passengers**

ED Decision 2018/004/R

**CARRIAGE OF CHILDREN AND PERSONS WITH REDUCED MOBILITY**

The pilot-in-command may exclude children or persons with reduced mobility from transportation in a balloon when:

- (a) their presence may impede:
  - (1) the crew in their duties;
  - (2) access to emergency equipment; or
  - (3) the emergency evacuation of the balloon; or
- (b) those persons are:
  - (1) unable to take a proper brace position;
  - (2) smaller than the inner height of the basket wall; or
  - (3) unable to understand the passenger briefing.

**BOP.BAS.125 Submission of the air traffic service flight plan**

Regulation (EU) 2018/395

- (a) If an air traffic service (ATS) flight plan is not submitted because it is not required in accordance with point (b) of point SERA.4001 of the Annex to [Implementing Regulation \(EU\) No 923/2012](#), the pilot-in-command shall submit adequate information in order to permit alerting services to be activated if required.
- (b) When operating from an operating site where it is impossible to submit an ATS flight plan, although required in accordance with point (b) of point SERA.4001 of the Annex to [Implementing Regulation \(EU\) No 923/2012](#), the pilot-in-command shall submit the ATS flight plan after take-off.

**AMC1 BOP.BAS.125 Submission of the air traffic service flight plan**

ED Decision 2018/004/R

**FLIGHTS WITHOUT ATS FLIGHT PLAN**

- (a) The operator should nominate a person to be responsible for alerting search and rescue services for flights without submitted ATS flight plans.
- (b) The operator should establish procedures to ensure that the expected route of each flight is communicated to the ground crew, and should:
  - (1) provide the nominated person with at least the information required to be included in a visual flight rules (VFR) flight plan;
  - (2) notify the appropriate ATS or search and rescue facility when a balloon is overdue or missing; and
  - (3) ensure that the information is retained at a designated place until the completion of the flight.

## BOP.BAS.130 Flight preparation

*Regulation (EU) 2018/395*

Before commencing the flight, the pilot-in-command shall be familiar with the available meteorological and aeronautical information appropriate to the intended flight which includes both of the following:

- (a) a study of available current weather reports and forecasts;
- (b) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned.

## BOP.BAS.135 Smoking on board

*Regulation (EU) 2018/395*

No person shall smoke on board a balloon during any phase of flight or within the direct vicinity of a balloon.

## BOP.BAS.140 Carriage and use of weapons

*Regulation (EU) 2018/395*

- (a) The pilot-in-command shall ensure that no person carries and uses a weapon on board the balloon.
- (b) By way of derogation from point (a), the pilot-in-command may permit the carriage and use of weapons on board the balloon when required for the safety of the crew members or the passengers. In such cases the pilot-in-command shall ensure that the weapons are secured when not in use.

## BOP.BAS.145 Meteorological conditions

*Regulation (EU) 2018/395*

The pilot-in-command shall only commence or continue a VFR flight if the latest available meteorological information indicates that the weather conditions along the route and at the intended destination at the estimated time of use are as follows:

- (a) at or above the applicable VFR operating minima; and
- (b) within the meteorological limitations specified in the AFM.

## BOP.BAS.150 Take-off conditions

*Regulation (EU) 2018/395*

The pilot-in-command shall be satisfied before commencing take-off of the balloon that, according to the latest available information, the weather at the operating site permits a safe take-off and departure.

## AMC1 BOP.BAS.150 Take-off conditions

*ED Decision 2018/004/R*

### FACILITIES AT THE TAKE-OFF SITE

At the balloon take-off site a means of assessing wind direction and wind speed should be available to the pilot-in-command.

## BOP.BAS.155 Approach and landing conditions

*Regulation (EU) 2018/395*

Except in emergency situations, the pilot-in-command shall be satisfied before commencing an approach to land that, according to the latest available information, the conditions at the intended operating site permit a safe approach and landing.

## BOP.BAS.160 Simulated situations in flight

*Regulation (EU) 2018/395*

- (a) The pilot-in-command shall not simulate situations that require the application of abnormal or emergency procedures when carrying passengers.
- (b) By way of derogation from point (a), the pilot-in-command may simulate such situations, during operations other than commercial operations of the balloon, when conducting training flights either with student pilots or with passengers, provided that the passengers have been duly informed and agreed to the simulation in advance.

## BOP.BAS.165 In-flight fuel management

*Regulation (EU) 2018/395*

The pilot-in-command shall check at regular intervals during the flight that the amount of usable fuel or ballast remaining in flight is not less than the fuel or ballast needed to complete the intended flight and the reserve planned for landing.

## BOP.BAS.170 Refuelling with persons on board

*Regulation (EU) 2018/395*

- (a) Refuelling of balloons shall not be conducted when persons are on board.
- (b) By derogation from point (a), refuelling the engine of hot-air airships may be conducted with the pilot-in-command on board.

## GM1 BOP.BAS.170 Refuelling with persons on board

*ED Decision 2018/004/R*

### REPLACEMENT OF FUEL CYLINDERS

The definition of 'refuelling' in Annex I excludes the replacement of fuel cylinders. Therefore, the replacement of fuel cylinders may be conducted, observing the appropriate precautions, when persons are on board.

## BOP.BAS.175 Use of restraint system

*Regulation (EU) 2018/395*

When a restraint system is required in accordance with point [BOP.BAS.320](#), the pilot-in-command shall wear the system at least during landing.

**BOP.BAS.180 Use of supplemental oxygen**

Regulation (EU) 2018/395

The pilot-in-command shall ensure that:

- (a) all crew members engaged in performing duties essential to the safe operation of the balloon use supplemental oxygen continuously whenever he or she determines that, at the altitude of the intended flight, the lack of oxygen might result in impairment of the faculties of crew members; and
- (b) supplemental oxygen is available to passengers when lack of oxygen might harmfully affect them.

**AMC1 BOP.BAS.180 Use of supplemental oxygen**

ED Decision 2018/004/R

**GENERAL**

When the pilot-in-command cannot determine how the lack of oxygen might affect all occupants on board, he or she should ensure that:

- (a) all flight crew members engaged in performing duties essential to the safe operation of a balloon use supplemental oxygen for any period in excess of 30 minutes when the pressure altitude is between 10 000 and 13 000 ft; and
- (b) all occupants use supplemental oxygen for any period when the pressure altitude is above 13 000 ft.

**BOP.BAS.185 Operational limitations at night**

Regulation (EU) 2018/395

- (a) Hot-air balloons:
  - (1) shall not land during night, except in emergency situations; and
  - (2) may take off during night, provided that sufficient fuel or ballast is carried for a landing during day.
- (b) Gas balloons and mixed balloons:
  - (1) shall not land during night, except in emergency situations or as a precautionary landing; and
  - (2) may take off during night, provided that sufficient fuel or ballast is carried for a landing during day.
- (c) Hot-air airships shall be operated in accordance with their approved VFR night operating limitations and information.



**GM1 BOP.BAS.185(a);(b) Operational limitations at night**

ED Decision 2018/004/R

**AVOIDANCE OF NIGHT LANDING**

- (a) The intent of the rule is to ensure that when the balloon takes off during night, sufficient fuel is on board for landing under VFR by day.
- (b) The risk of collision with overhead lines or other obstacles is considerable and cannot be overstated. The risk is considerably increased during night flights, in conditions of failing light and visibility, when there is increasing pressure to land. A number of incidents have occurred in the late evening in such conditions, and may have been avoided had an earlier landing been planned.

**BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist**

Regulation (EU) 2018/395

- (a) Before commencing a balloon specialised operation, the pilot-in-command shall conduct a risk assessment, assessing the complexity of the activity in order to determine the hazards and associated risks of the intended operation and establish mitigating measures where necessary.
- (b) A balloon specialised operation shall be performed in accordance with a checklist. The pilot-in-command shall establish that checklist and ensure that it is appropriate to the specialised activity and balloon used, based on the risk assessment and taking account of all requirements set out in this Subpart. The checklist shall be readily accessible on each flight to the pilot-in-command and other crew members, where it is relevant for the performance of their duties.
- (c) The pilot-in-command shall regularly review and update the checklist where necessary in order to adequately take account of the risk assessment.

**AMC1 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist**

ED Decision 2018/004/R

**CRITERIA FOR BALLOON SPECIALISED OPERATIONS**

The pilot-in-command or the operator should consider the following criteria to determine whether an activity falls within the scope of balloon specialised operations:

- (a) special equipment is necessary to fulfil the task and which affects the behaviour of the balloon in flight;
- (b) external loads are lifted; or
- (c) persons enter or leave the balloon during flight.

## AMC2 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

*ED Decision 2018/004/R*

### DEVELOPMENT OF CHECKLIST

In order to develop a checklist, the pilot-in-command should take into account at least the following items:

- (a) nature and complexity of the activity:
  - (1) the nature of the flight and risk exposure;
  - (2) the complexity of the activity taking into account the necessary pilot skills and level of experience, ground support, and individual protective equipment;
  - (3) the operational environment and geographical area; and
  - (4) the result of the risk assessment and evaluation;
- (b) balloon and equipment:

all equipment required for the activity should be listed;
- (c) crew members:
  - (1) crew composition;
  - (2) duties of crew members;
  - (3) minimum crew experience and training provisions; and
  - (4) recency provisions;
- (d) normal, abnormal and emergency procedures:
  - (1) operating procedures for the flight crew; and
  - (2) ground procedures for crew members; and
- (e) records:

it should be determined which records specific to the flight(s) are to be kept, such as task details, balloon registration, pilot-in-command, flight times, weather and any remarks, including a record of occurrences affecting flight safety or the safety of persons or property on the ground.

## AMC3 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

*ED Decision 2018/004/R*

### CHECKLIST FOR PARACHUTE OPERATIONS

The checklist for parachute operations should include:

- (a) normal, abnormal and emergency procedures;
- (b) relevant performance data;
- (c) required equipment;
- (d) any limitations such as maximum take-off mass and minimum landing mass; and
- (e) responsibilities and duties of the pilot-in-command and, if applicable, of crew members.

## GM1 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

*ED Decision 2018/004/R*

### LIST OF OPERATIONS

- (a) Balloon specialised operations include the following activities:
  - (1) parachute operations;
  - (2) hang-gliding dropping; and
  - (3) special events flights, including flying displays and competition flights.
- (b) The following operations are not considered balloon specialised operations, but normal operations:
  - (1) aerial advertising flights; and
  - (2) news media flights, television and movie flights.

## GM2 BOP.BAS.190 Balloon specialised operations — Risk assessment and checklist

*ED Decision 2018/004/R*

### CATEGORISATION OF OPERATIONS

The pilot-in-command or the operator determines whether the main purpose of an operation is passenger ballooning, commercial or not, or whether the activity falls within the scope of a balloon specialised operation. As regards a balloon specialised operation, the pilot-in-command or the operator applies the criteria in [AMC1 BOP.BAS.190](#) and the activities listed in [GM1 BOP.BAS.190](#).

## SECTION 3 — PERFORMANCE AND OPERATING LIMITATIONS

### BOP.BAS.200 Operating limitations

*Regulation (EU) 2018/395*

The pilot-in-command shall ensure that, during any phase of operation, the balloon is not exceeding any of the limitations set out in the AFM or equivalent document(s).

### GM1 BOP.BAS.200 Operating limitations

*ED Decision 2018/004/R*

#### GENERAL

In most cases the operating limitations are documented in the AFM, and in certain cases in the operations manual.

### BOP.BAS.205 Weighing

*Regulation (EU) 2018/395*

- (a) The weighing of the balloon shall be accomplished by the manufacturer of the balloon or in accordance with Annex I to [Regulation \(EU\) No 1321/2014](#).
- (b) The operator shall ensure that the mass of the balloon has been established by actual weighing prior to its initial entry into service. The accumulated effects of modifications and repairs on the mass shall be accounted for and properly documented. Such information shall be made available to the pilot-in-command. The balloon shall be reweighed if the effects of modifications or repairs on the mass are not known.

### GM1 BOP.BAS.205 Weighing

*ED Decision 2018/004/R*

#### GENERAL

- (a) New balloons that have been weighed at the factory may be placed into operation without reweighing if the mass records have been adjusted for alterations or modifications to the balloon. Balloons transferred from one EU operator to another EU operator do not have to be weighed prior to use by the receiving operator, unless the mass cannot be accurately established by calculation.
- (b) The initial empty mass for a balloon is the balloon empty mass determined by a weighing performed by the manufacturer of the balloon before the initial entry into service.
- (c) The mass of a balloon is revised whenever the cumulative changes to the balloon empty mass due to modifications or repairs exceed  $\pm 10\%$  of the initial empty mass. This may be done by weighing the balloon or by calculation.

### BOP.BAS.210 Performance — General

*Regulation (EU) 2018/395*

The pilot-in-command shall only operate the balloon if the performance of the balloon is adequate to comply with the requirements set out in the Annex to [Implementing Regulation \(EU\) No 923/2012](#) and any other restrictions applicable to the flight, the airspace or operating sites used, ensuring that any charts or maps used are the latest available edition.

## SECTION 4 — INSTRUMENTS AND EQUIPMENT

### BOP.BAS.300 Instruments and equipment — General

*Regulation (EU) 2018/395*

- (a) Instruments and equipment required by this Section shall be approved in accordance with Annex I to [Regulation \(EU\) No 748/2012](#) if one of the following conditions is fulfilled:
  - (1) they are used to comply with points [BOP.BAS.355](#) and [BOP.BAS.360](#);
  - (2) they are permanently installed in the balloon.
- (b) By way of derogation from point (a), all of the following instruments or equipment, when required by this Section, shall not need an approval:
  - (1) instruments or equipment used by the flight crew to determine the flight path;
  - (2) independent portable lights;
  - (3) an accurate time piece;
  - (4) first-aid kit;
  - (5) survival and signalling equipment;
  - (6) supplemental oxygen storage and dispensing apparatus;
  - (7) alternative source of ignition;
  - (8) fire blanket or fire-resistant cover;
  - (9) hand fire extinguisher;
  - (10) drop line;
  - (11) knife.
- (c) Instruments and equipment not required by this Section, as well as any other equipment that is not required by this Annex but is carried on board a balloon during a flight, shall comply with both of the following conditions:
  - (1) the information provided by those instruments or equipment shall not be used by the flight crew to comply with the essential requirements for airworthiness set out in Annex I to [Regulation \(EC\) No 216/2008](#);
  - (2) the instruments and equipment shall not affect the airworthiness of the balloon, even in the case of failures or malfunction.
- (d) Instruments and equipment shall be readily operable or accessible from the station where the flight crew member that needs to use it is assigned.
- (e) All required emergency equipment shall be easily accessible for immediate use.

### GM1 BOP.BAS.300(a) Instruments and equipment — General

*ED Decision 2018/004/R*

#### APPLICABLE AIRWORTHINESS REQUIREMENTS

The applicable airworthiness requirements for the approval of instruments and equipment required by this Annex are the following:

- (a) Annex I (Part 21) to [Regulation \(EU\) No 748/2012](#) for balloons registered in the EU; and
- (b) airworthiness requirements of the State of registry for balloons registered outside the EU.

## GM1 BOP.BAS.300(a)(2) Instruments and equipment - General

*ED Decision 2018/004/R*

### PERMANENTLY INSTALLED

‘Permanently installed’ means an instrument or equipment that requires a specific kind of installation to:

- (a) perform its intended function;
- (b) be operated according to its specified limitations; and
- (c) minimise the hazards to the balloon in the event of a probable malfunction or failure.

## GM1 BOP.BAS.300(b) Instruments and equipment — General

*ED Decision 2018/004/R*

### REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED

The functionality of non-installed instruments and equipment, required by this Subpart and that do not need an equipment approval, are checked against recognised industry standards appropriate to the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

## GM1 BOP.BAS.300(c) Instruments and equipment — General

*ED Decision 2018/004/R*

### NOT REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED

- (a) The provision of this paragraph does not exempt any installed instrument or item of equipment from complying with the applicable airworthiness requirements. In this case, the installation should be approved as required by the applicable airworthiness requirements and should comply with the applicable certification specifications.
- (b) The failure of additional, non-installed instruments or equipment not required by this Annex or by the applicable airworthiness requirements or any applicable airspace requirements should not adversely affect the airworthiness or the safe operation of the balloon.

## BOP.BAS.305 Minimum instruments and equipment for flight

*Regulation (EU) 2018/395*

A balloon flight shall not be commenced when any of the instruments and equipment required for the intended flight with the balloon are missing, inoperative or do not fulfil the required functions.

**AMC1 BOP.BAS.305 Minimum instruments and equipment for flight**

ED Decision 2018/004/R

**GENERAL**

Instruments and equipment that must be operative for all flights should be identified in a list. These instruments and equipment are:

- (a) included in the type certification data sheet (TCDS) or the AFM; and
- (b) required by the applicable implementing rules, such as operational and airspace requirements, and any other applicable requirements for the intended operation.

**BOP.BAS.310 Operating lights**

Regulation (EU) 2018/395

Balloons operated at night shall be equipped with all of the following:

- (a) an anti-collision light;
- (b) a means to provide adequate illumination for all instruments and equipment essential to the safe operation of the balloon;
- (c) an independent portable light.

**AMC1 BOP.BAS.310 Operating lights**

ED Decision 2018/004/R

**ANTI-COLLISION LIGHTS AND ILLUMINATION FOR INSTRUMENTS AND EQUIPMENT**

- (a) An acceptable means of compliance for free manned balloons should be the anti-collision light required for VFR at night approved in accordance with CS-31HB/CS-31GB or with the applicable provisions for hot-air airships.
- (b) A means of providing adequate illumination to instruments and equipment essential to the safe operation of the balloon may be an independent portable light.

**BOP.BAS.315 Flight and navigational instruments and equipment**

Regulation (EU) 2018/395

Balloons operated under VFR by day shall be equipped with both of the following:

- (a) a means of displaying drift direction;
- (b) a means of measuring and displaying:
  - (1) time in hours, minutes and seconds;
  - (2) vertical speed, if required by the AFM; and
  - (3) pressure altitude, if required by the AFM, when required by airspace requirements or when the altitude needs to be known for the use of oxygen.



## AMC1 BOP.BAS.315(a) Flight and navigational instruments and associated equipment

*ED Decision 2018/004/R*

### MEANS OF DISPLAYING DRIFT DIRECTION

The drift direction may be determined by using a map and reference to visual landmarks.

## AMC1 BOP.BAS.315(b)(1) Flight and navigational instruments and associated equipment

*ED Decision 2018/004/R*

### MEANS OF MEASURING AND DISPLAYING THE TIME

A means of measuring and displaying the time in hours, minutes and seconds may be a wristwatch capable of the same functions.

## GM1 BOP.BAS.315(b)(3) Flight and navigational instruments and associated equipment

*ED Decision 2018/004/R*

### MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

A means of measuring and displaying pressure altitude is needed when required by air traffic control or when altitude needs to be checked for flights where oxygen is used, or the limitations in the AFM require to limit altitude or rate of climb or descent.

## BOP.BAS.320 Restraint systems

*Regulation (EU) 2018/395*

Balloons shall be equipped with a restraint system for the pilot-in-command when the balloon is equipped with one of the following:

- (a) a separate compartment for the pilot-in-command;
- (b) turning vent(s).

## GM1 BOP.BAS.320 Restraint system

*ED Decision 2018/004/R*

### EQUIPMENT REQUIREMENTS

A pilot restraint harness mounted to the basket is considered to meet the requirements of CS-31HB/CS-31GB for a restraint system.

## BOP.BAS.325 Supplemental oxygen

*Regulation (EU) 2018/395*

Balloons operated when an oxygen supply is required in accordance with point [BOP.BAS.180](#) shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the required oxygen supplies.

**BOP.BAS.330 First-aid kit**

Regulation (EU) 2018/395

- (a) Balloons shall be equipped with a first-aid kit.
- (b) The first-aid kit shall be:
  - (1) readily accessible for use; and
  - (2) kept up-to-date.

**AMC1 BOP.BAS.330 First-aid kit**

ED Decision 2018/004/R

**CONTENT OF THE FIRST-AID KIT**

- (a) The first-aid kit should be equipped with appropriate and sufficient medications and instrumentation. However, the kit should be amended by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).
- (b) The following should be included in the first-aid kit:
  - (1) bandages (assorted sizes);
  - (2) burns dressings (large and small);
  - (3) wound dressings (large and small);
  - (4) adhesive dressings (assorted sizes);
  - (5) antiseptic wound cleaner;
  - (6) safety scissors; and
  - (7) disposable gloves.

**AMC2 BOP.BAS.330 First-aid kit**

ED Decision 2018/004/R

**MAINTENANCE OF FIRST-AID KIT**

To be kept up to date, the first-aid kit should be:

- (a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;
- (b) replenished at regular intervals, in accordance with the instructions contained on their labels, or as circumstances warrant; and
- (c) replenished after use in flight at the first opportunity where replacement items are available.

**GM1 BOP.BAS.330(a) First-aid kit**

ED Decision 2018/004/R

**ADDITIONAL FIRST-AID KIT**

An additional first-aid kit may be carried in the retrieve vehicle or trailer.

## BOP.BAS.335 Hand fire extinguishers

*Regulation (EU) 2018/395*

Except for gas balloons, balloons shall be equipped with at least one hand fire extinguisher.

## AMC1 BOP.BAS.335 Hand fire extinguishers

*ED Decision 2018/004/R*

### CERTIFICATION SPECIFICATIONS

The applicable certification specification for hot-air balloons should be CS-31HB or equivalent.

## GM1 BOP.BAS.335 Hand fire extinguishers

*ED Decision 2018/004/R*

### ADDITIONAL HAND FIRE EXTINGUISHER

An additional hand fire extinguisher may be carried in the retrieve vehicle or trailer.

## BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*Regulation (EU) 2018/395*

The pilot-in-command of a balloon operated over water shall determine, before commencing the flight, the risks to survival of the persons carried in the balloon in the event of ditching. In light of those risks, he or she shall determine whether there is need to carry life-saving and signalling equipment.

## AMC1 BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*ED Decision 2018/004/R*

### RISK ASSESSMENT

In order to determine the risk, the pilot-in-command should take the following operating environment and conditions into account:

- (a) water state;
- (b) water and air temperatures;
- (c) the distance from land suitable for making an emergency landing; and
- (d) the availability of search and rescue facilities.

## AMC2 BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*ED Decision 2018/004/R*

### EQUIPMENT

Based on the risk assessment, the pilot-in-command should determine the carriage of:

- (a) a life jacket or equivalent individual flotation device for each person on board that should:

- (1) be worn or stowed in a position that is readily accessible from the station of the person for whose use it is provided; and
- (2) be equipped with a means of electric illumination for the purpose of facilitating the location of persons;
- (b) when carrying up to six persons, an emergency locator transmitter (ELT) or a personal locator beacon (PLB), carried by a crew member or a passenger, capable of transmitting simultaneously on 121.5 and 406 MHz;
- (c) when carrying more than six persons, an ELT capable of transmitting simultaneously on 121.5 and 406 MHz; and
- (d) signalling equipment for making distress signals.

### AMC3 BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*ED Decision 2018/004/R*

#### BRIEFING ON PLB USE

When a PLB is carried by a passenger, he or she should be briefed on its characteristics and use by the pilot-in-command before the flight.

### AMC4 BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*ED Decision 2018/004/R*

#### ELT AND PLB REGISTRATION AND OPERATION PROVISIONS

- (a) Any ELT and PLB carried should be registered with the national agency responsible for initiating search and rescue, or another nominated agency.
- (b) Any ELT carried should operate in accordance with the relevant provisions of Volume III of ICAO Annex 10 to the Chicago Convention, 'Aeronautical telecommunications'.

### GM1 BOP.BAS.340 Life-saving and signalling equipment – Flights over water

*ED Decision 2018/004/R*

#### TERMINOLOGY

- (a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.
- (b) A PLB is an emergency beacon, other than an ELT, that broadcasts distinctive signals at designated frequencies, is stand-alone, portable, and is manually activated by the survivors.

## BOP.BAS.345 Life-saving and signalling equipment – Search and rescue difficulties

*Regulation (EU) 2018/395*

Balloons operated over areas in which search and rescue (SAR) would be especially difficult shall be equipped with such life-saving and signalling equipment as appropriate to the area overflown.

## AMC1 BOP.BAS.345 Life-saving and signalling equipment – Search and rescue difficulties

*ED Decision 2018/004/R*

### GENERAL

Balloons operated across land areas in which search and rescue would be especially difficult should be equipped with the following:

- (a) at least one ELT or a PLB;
- (b) signalling equipment for making distress signals; and
- (c) additional survival equipment adequate for the route to be flown taking account of the number of persons on board.

## AMC2 BOP.BAS.345 Life-saving and signalling equipment – Search and rescue difficulties

*ED Decision 2018/004/R*

### ADDITIONAL SURVIVAL EQUIPMENT

- (a) The following additional survival equipment should be carried:
  - (1) 500 ml of water for each four, or fraction of four, persons on board;
  - (2) one knife; and
  - (3) first-aid equipment.
- (b) If any item of equipment in (a) is already carried on board in accordance with other requirements, the carriage does not need to be duplicated.

## GM1 BOP.BAS.345 Life-saving and signalling equipment – Search and rescue difficulties

*ED Decision 2018/004/R*

### SIGNALS

The distress signals are described in [Regulation \(EU\) No 923/2012](#)<sup>1</sup>.

<sup>1</sup> Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.12.2012, p. 1).

## GM2 BOP.BAS.345 Life-saving and signalling equipment – Search and rescue difficulties

*ED Decision 2018/004/R*

### AREAS IN WHICH SEARCH AND RESCUE WOULD BE ESPECIALLY DIFFICULT

The expression ‘areas in which search and rescue would be especially difficult’ means:

- (a) areas so designated by the authority responsible for managing search and rescue; or
- (b) areas that are largely uninhabited and where the authority referred to in (a):
  - (1) has not published any information to confirm whether search and rescue would be or would not be especially difficult; and
  - (2) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

## BOP.BAS.350 Miscellaneous equipment

*Regulation (EU) 2018/395*

- (a) Balloons shall be equipped with protective gloves for each crew member.
- (b) Mixed balloons, hot-air balloons and hot-air airships shall be equipped with all of the following:
  - (1) an alternative and independent source of ignition;
  - (2) a means of measuring and indicating fuel quantity;
  - (3) a fire blanket or fire-resistant cover;
  - (4) a drop line of at least 25 m in length.
- (c) Gas balloons shall be equipped with both of the following:
  - (1) a knife;
  - (2) a trail rope of at least 20 m in length made of natural fibre or electrostatic, conductive material.

## AMC1 BOP.BAS.350(b)(3) Miscellaneous equipment

*ED Decision 2018/004/R*

### FIRE BLANKET

A fire blanket should comply with the European Norm EN 1869 or equivalent. The size should be at least 1.5 m × 1.8 m. Smaller sizes are not recommended as they cannot sufficiently cover the source of developing propane fire.

## AMC1 BOP.BAS.350(c)(1) Miscellaneous equipment

*ED Decision 2018/004/R*

### KNIFE

The knife, hook knife or equivalent, should be capable of cutting any control line or handling rope that is accessible to the pilot-in-command or a crew member from the basket.

## BOP.BAS.355 Radio communication equipment

*Regulation (EU) 2018/395*

- (a) Balloons shall have radio communication equipment to allow for the communication required in accordance with appendix 4 to the Annex to [Implementing Regulation \(EU\) No 923/2012](#) and, if the flight takes place in the airspace of a third country, the law of that third country.
- (b) The radio communication equipment shall provide for communication on the aeronautical emergency frequency 121,5 MHz.

## GM1 BOP.BAS.355 Radio communication equipment

*ED Decision 2018/004/R*

### APPLICABLE AIRSPACE REQUIREMENTS

For balloons being operated under European air traffic control, the applicable airspace requirements include the single European sky legislation.

## BOP.BAS.360 Transponder

*Regulation (EU) 2018/395*

Balloons shall have a secondary surveillance radar (SSR) transponder with all the capabilities required in accordance with point (b) of point SERA.6005 of the Annex to Implementing Regulation (EU) No 923/2012 and, if the flight takes places in airspace of a third country, the law of that third country.

## AMC1 BOP.BAS.360 Transponder

*ED Decision 2018/004/R*

### GENERAL

- (a) The secondary surveillance radar (SSR) transponders of balloons being operated under European air traffic control should comply with any applicable single European sky legislation.
- (b) If the single European sky legislation is not applicable, the SSR transponders should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10 to the Chicago Convention, 'Aeronautical telecommunications'.



## SUBPART ADD — ADDITIONAL REQUIREMENTS FOR COMMERCIAL OPERATIONS

### SECTION 1 — GENERAL ORGANISATION REQUIREMENTS

#### BOP.ADD.001 Scope

*Regulation (EU) 2018/395*

In accordance with [Article 3](#), this Subpart establishes the requirements to be met, in addition to the requirements of Subpart BAS, by any operator engaged in commercial operations with balloons, other than the operators referred to in the last subparagraph [Article 3\(2\)](#).

#### BOP.ADD.005 Responsibilities of the operator

*Regulation (EU) 2018/395*

- (a) The operator shall be responsible for the operation of the balloon in accordance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#), with the requirements of this Subpart and with its declaration.
- (b) Every flight shall be conducted in accordance with the provisions of the operations manual.
- (c) The operator shall ensure that the balloon is equipped and all crew members are qualified as required for the area and type of operation.
- (d) The operator shall ensure that all crew members assigned to, or directly involved in, flight operations comply with all of the following conditions:
  - (1) they are properly trained and instructed;
  - (2) they are aware of the rules and procedures relevant to their particular duties;
  - (3) they have demonstrated their abilities in their particular duties;
  - (4) they are aware of their responsibilities and the relationship of such duties to the operation of the balloon as a whole.
- (e) The operator shall establish procedures and instructions for the safe operation of each balloon type, containing duties and responsibilities of the crew members, for all types of operations. Those procedures and instructions shall not require crew members to perform any activity during critical phases of flight other than those required for the safe operation of the balloon.
- (f) The operator shall make arrangements for the supervision of crew members and personnel involved in the operation of the balloon by individuals with adequate experience and skills in order to ensure the attainment of the standards specified in the operations manual.
- (g) The operator shall ensure that all crew members and personnel involved in the operation of the balloon are made aware that they are to comply with the laws, regulations and procedures of the States in which operations are conducted that are pertinent to the performance of their duties.
- (h) The operator shall specify flight planning procedures to provide for the safe conduct of the flight, based on considerations of balloon performance, other operating limitations and relevant expected conditions on the route to be followed and at the operating sites concerned. Those procedures shall be included in the operations manual.

## BOP.ADD.010 Notification of alternative means of compliance

*Regulation (EU) 2018/395*

The operator shall, when making the declaration in accordance with point [BOP.ADD.100](#), notify to the competent authority the list of alternative means of compliance (AltMoC), where it intends to use AltMoC to demonstrate compliance when so requested in accordance with point [BOP.BAS.010](#). That list shall contain references to the acceptable means of compliance (AMC) which they replace in case associated AMC have been adopted by the Agency.

## AMC1 BOP.ADD.010 Notification of alternative means of compliance

*ED Decision 2018/004/R*

### DEMONSTRATION OF COMPLIANCE

Whenever alternative means of compliance are used, a risk assessment should be completed and documented. The result of this risk assessment should demonstrate that an equivalent level of safety to that established by the AMC adopted by EASA is reached.

## BOP.ADD.015 Access

*Regulation (EU) 2018/395*

- (a) For the purpose of determining compliance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation, the operator shall grant access to any person authorised by the competent authority at any time to any facility, balloon, document, records, data, procedures or any other material relevant to the operator's activity falling within the scope of this Regulation, irrespective of whether the activity is contracted or not.
- (b) Access to the balloon shall, in the case of commercial passenger ballooning, include the possibility to enter and remain in the balloon during flight operations, unless to do so would endanger the flight.

## BOP.ADD.020 Findings

*Regulation (EU) 2018/395*

After receipt of the notification of findings raised by the competent authority in accordance with points ARO.GEN.350, ARO.GEN.355 and ARO.GEN.360 of Annex II to [Regulation \(EU\) No 965/2012](#), the operator shall do all of the following:

- (a) identify the root cause of the non-compliance;
- (b) define a corrective action plan;
- (c) demonstrate implementation of the corrective action plan to the satisfaction of the competent authority within the time period specified by that authority in accordance with point ARO.GEN.350 of Annex II to [Regulation \(EU\) No 965/2012](#).

## AMC1 BOP.ADD.020(b) Findings

ED Decision 2018/004/R

### CORRECTIVE ACTION PLAN

The corrective action plan defined by the operator should address the effects of non-compliance, as well as its root cause.

## GM1 BOP.ADD.020(b);(c) Findings

ED Decision 2018/004/R

### CORRECTIVE ACTION

‘Corrective action’ means the action to eliminate or mitigate the root cause(s) and prevent recurrence of an existing detected non-compliance or other undesirable condition or situation. Proper determination of the root cause(s) is crucial for defining effective corrective actions to prevent reoccurrence.

## BOP.ADD.025 Occurrence reporting

Regulation (EU) 2018/395

- (a) The operator shall implement, as part of its management system, an occurrence reporting scheme which is to provide for mandatory and voluntary reporting in accordance with [Regulation \(EU\) No 376/2014](#) of the European Parliament and of the Council<sup>1</sup>.
- (b) Without prejudice to point (a), the operator shall report to the competent authority and to the organisation responsible for the design of the balloon any malfunction, technical defect, exceeding of technical limitations or occurrence that would highlight inaccurate, incomplete or ambiguous information contained in data established in accordance with Annex I to [Regulation \(EU\) No 748/2012](#) and any other occurrence which constitutes an incident but not an accident or serious incident.
- (c) The operator shall take the necessary measures to ensure compliance with Article 9 of [Regulation \(EU\) No 996/2010](#) of the European Parliament and of the Council<sup>2</sup> by the pilot-in-command, any other crew member and all its personnel in respect of any serious incident or accident associated with the operation of a balloon.

<sup>1</sup> Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18).

<sup>2</sup> Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (OJ L 295, 12.11.2010, p. 35).

**AMC1 BOP.ADD.025(a) Occurrence reporting**

ED Decision 2018/004/R

**GENERAL**

Additionally to reporting all occurrences required by [Regulation \(EU\) No 376/2014](#)<sup>1</sup>, the operator should also report those specified in [Regulation \(EU\) 2015/1018](#)<sup>2</sup>.

**BOP.ADD.030 Management system**

Regulation (EU) 2018/395

- (a) The operator shall establish, implement and maintain a management system that includes all of the following:
- (1) clearly defined lines of responsibility and accountability throughout the organisation of the operator, including a direct safety accountability of the accountable manager;
  - (2) a description of the overall philosophies and principles of the operator with regard to safety, which shall be known as the safety policy;
  - (3) the identification of aviation safety hazards entailed by the activities of the operator, the evaluation of those hazards and the management of associated risks, including by taking actions to mitigate those risks where necessary and verifying the effectiveness of those actions;
  - (4) maintaining personnel trained and competent to perform their tasks;
  - (5) documentation of all key processes of the management system, including a process for making personnel aware of their responsibilities and the procedure for amending that documentation;
  - (6) a function to monitor compliance of the operator with the requirements of this Annex. Such compliance monitoring shall include a feedback system of findings to the accountable manager of the operator to ensure effective implementation of corrective actions as necessary;
  - (7) the processes necessary to ensure compliance with the requirements of Articles 4, 5, 6 and 13 of [Regulation \(EU\) No 376/2014](#).
- (b) The management system shall correspond to the size of the operator and the nature and complexity of its activities, taking into account the hazards and associated risks of those activities.

<sup>1</sup> Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18).

<sup>2</sup> Commission Implementing Regulation (EU) 2015/1018 of 29 June 2015 laying down a list classifying occurrences in civil aviation to be mandatorily reported according to Regulation (EU) No 376/2014 of the European Parliament and of the Council (OJ L 163, 30.6.2015, p. 1).

**AMC1 BOP.ADD.030(a)(2) Management system**

ED Decision 2018/004/R

**SAFETY POLICY**

The safety policy should include a commitment to improve towards the highest safety standards, comply with all applicable legal requirements, meet all applicable standards, consider best practices, and provide appropriate resources.

**AMC1 BOP.ADD.030(a)(3) Management system**

ED Decision 2018/004/R

**SAFETY RISK MANAGEMENT**

Hazard identification and safety risk management should:

- (a) be performed using internal safety or occurrence reports, hazard checklists, risk registers or similar risk management tools or processes, integrated into the activities of the operator;
- (b) in particular address safety risks related to a change; by making use of the existing hazard identification, risk assessment and mitigation tools or processes; and
- (c) include provisions for emergency response or a formal emergency response plan (ERP) to define the actions to be taken by the operator or specified individuals in an emergency.

**GM1 BOP.ADD.030(a)(4) Management system**

ED Decision 2018/004/R

**TRAINING ON SAFETY**

The safety training programme may consist of self-instruction via the media (newsletters, flight safety magazines, etc), classroom training, e-learning or similar training provided by training service providers.

**AMC1 BOP.ADD.030(a)(5) Management system**

ED Decision 2018/004/R

**MANAGEMENT SYSTEM DOCUMENTATION**

- (a) The operator's management system documentation should at least include the following information:
  - (1) a statement signed by the accountable manager to confirm that the operator will continuously work in accordance with the applicable requirements and the operator's documentation, as required by this Annex;
  - (2) the operator's scope of activities;
  - (3) the titles and names of persons referred to in [BOP.ADD.040\(a\) and \(c\)](#);
  - (4) an organisation chart showing the lines of responsibility among the persons referred to in [BOP.ADD.040](#);
  - (5) a general description and location of the facilities referred to in [BOP.ADD.045](#);
  - (6) procedures specifying how the operator ensures compliance with the applicable requirements;

- (7) the amendment procedure for the operator's management system documentation.
- (b) The operator's management system documentation may be included in a separate manual, or in (one of) the manual(s) required in this Annex. A cross reference should be included.

## **AMC1 BOP.ADD.030(a)(6) Management system**

*ED Decision 2018/004/R*

### **COMPLIANCE MONITORING — AUDIT AND ORGANISATIONAL REVIEW**

- (a) Methodology
  - (1) The operator should accomplish the compliance monitoring by means of internal auditing.
  - (2) Notwithstanding (1), an operator with five or less full-time equivalents (FTEs), involved in the activity subject to this Subpart, may choose to accomplish compliance monitoring through an organisational review.
- (b) General provisions for compliance monitoring
  - (1) The operator should specify the basic structure of the compliance monitoring function applicable to the activities conducted.
  - (2) The operator should ensure that personnel performing an audit or an organisational review, either internal to the operator or external, have relevant knowledge, background and experience as appropriate to the activities being audited or reviewed, including knowledge and experience in compliance monitoring.
  - (3) The operator should monitor compliance with the procedures it has designed to ensure safe activities. In doing so, the operator should as a minimum, and where appropriate, monitor compliance with:
    - (i) all activities for which the declaration is required;
    - (ii) manuals, logs and records;
    - (iii) training standards;
    - (iv) management system procedures; and
    - (v) standard operating procedures (SOPs).
  - (4) The operator should ensure that the status of all corrective and preventive actions is monitored and that these actions are implemented within a specified time frame. Action closure should be recorded along with a summary of the action taken.
  - (5) Based on the results of the audit or the organisational review, the accountable manager should determine the need for and initiate, as appropriate, further actions to address deficiencies or to further improve the operator's management system.
- (c) Provisions, in addition to (b), for auditing
  - (1) The independence of the audit function should be ensured, in particular in cases where those performing the audit are also responsible for other functions for the operator.
  - (2) The operator should establish a compliance monitoring programme, defining a calendar for the audits to be performed. The frequency and depth of such audits should be determined with due regard to:
    - (i) the volume and complexity of operations;

- (ii) results of the safety risk management processes;
  - (iii) results of past compliance monitoring;
  - (iv) findings raised by the competent authority; and
  - (v) the scope of changes not requiring prior competent authority approval.
- (d) Provisions, in addition to (b), for the organisational review
  - (1) The organisational review should be performed at intervals not exceeding 12 months.
  - (2) As part of the management system documentation, the operator should describe the organisational review programme and related responsibilities.
  - (3) The organisational review programme may consist of:
    - (i) checklist(s) covering all items necessary to be addressed in order to demonstrate that the operator ensures effective compliance with the applicable requirements; and
    - (ii) a schedule for the accomplishment of the different checklist items, where each item should be checked at least at intervals not exceeding 12 months.

## GM1 BOP.ADD.030(a)(6) Management system

*ED Decision 2018/004/R*

### COMPLIANCE MONITORING — AUDIT AND ORGANISATIONAL REVIEW

- (a) 'audit' means a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which requirements are complied with.
- (b) 'organisational review' means a systematic and documented process for obtaining evidence and evaluating it to determine the extent to which requirements are complied with.

## GM2 BOP.ADD.030(a)(6) Management system

*ED Decision 2018/004/R*

### COMPLIANCE MONITORING CHECKLIST

- (a) Compliance monitoring audits or organisational reviews may be documented using a compliance monitoring checklist. The following provides a basic checklist, to be adapted as necessary to address the particular type of operations and to cover all relevant procedures described in the management system documentation and operations manual.
- (b) Each checklist item may be addressed using an appropriate combination of:
  - (1) review of records and documentation;
  - (2) interview of the personnel involved; and
  - (3) feedback provided by contractors.

| <b>COMPLIANCE MONITORING CHECKLIST</b>                                                                                                                                                    |              |            |                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------|-----------------------------------|
| Year:                                                                                                                                                                                     |              |            |                                   |
| Subject                                                                                                                                                                                   | Date checked | Checked by | Comments/non-compliance Report No |
| <b>Declaration change management</b>                                                                                                                                                      |              |            |                                   |
| Operations have been performed in accordance with the declaration                                                                                                                         |              |            |                                   |
| Changes have been properly managed in accordance with the defined process                                                                                                                 |              |            |                                   |
| <b>Flight operations</b>                                                                                                                                                                  |              |            |                                   |
| Balloon checklists checked for accuracy and validity                                                                                                                                      |              |            |                                   |
| Flight plans checked for proper and correct information                                                                                                                                   |              |            |                                   |
| <b>Ground handling</b>                                                                                                                                                                    |              |            |                                   |
| Instructions regarding fuelling, if applicable                                                                                                                                            |              |            |                                   |
| Instructions regarding dangerous goods issued and known by all relevant personnel, if applicable                                                                                          |              |            |                                   |
| <b>Mass</b>                                                                                                                                                                               |              |            |                                   |
| Load sheets checked for proper and correct information, if applicable                                                                                                                     |              |            |                                   |
| <b>Pilot training</b>                                                                                                                                                                     |              |            |                                   |
| Updated and accurate training records                                                                                                                                                     |              |            |                                   |
| Pilot licences current, correct ratings and valid medical certificates                                                                                                                    |              |            |                                   |
| Pilots received recurrent training                                                                                                                                                        |              |            |                                   |
| Training facilities and instructors approved                                                                                                                                              |              |            |                                   |
| Pilots received pre-flight inspection training, as applicable                                                                                                                             |              |            |                                   |
| <b>Documentation related to operations</b>                                                                                                                                                |              |            |                                   |
| Operations manual checked for correct amendment status                                                                                                                                    |              |            |                                   |
| Flight documents record checked and updated                                                                                                                                               |              |            |                                   |
| <b>Personnel</b>                                                                                                                                                                          |              |            |                                   |
| Correctly identified current accountable manager and other nominated persons                                                                                                              |              |            |                                   |
| The organisation chart accurately indicates lines of responsibility and accountability throughout the organisation                                                                        |              |            |                                   |
| Qualifications of all new personnel (or personnel with new functions) have been appropriately assessed                                                                                    |              |            |                                   |
| Proper training has been provided to staff involved in any safety-management-related processes and tasks                                                                                  |              |            |                                   |
| Proper training has been provided to staff involved in any compliance-monitoring-related processes and tasks                                                                              |              |            |                                   |
| Training provided to staff, as necessary, to cover changes in regulations, in competent authority publications, in the management system documentation and in associated procedures, etc. |              |            |                                   |
| <b>Contracted activities (if applicable)</b>                                                                                                                                              |              |            |                                   |
| Assessment of any new providers prior to the establishment of any contract                                                                                                                |              |            |                                   |



|                                                                                                                                                                                       |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| For existing providers: check that the service provided conforms to the applicable requirements of this Annex                                                                         |  |  |  |
| <b>Training and communication on safety</b>                                                                                                                                           |  |  |  |
| All personnel are aware of safety management policies, processes and tasks                                                                                                            |  |  |  |
| Availability of safety-related documentation and publications                                                                                                                         |  |  |  |
| Safety-critical information derived from internal safety or occurrence reporting, hazard identification or compliance monitoring have been timely communicated to all staff concerned |  |  |  |
| <b>Management system documentation</b>                                                                                                                                                |  |  |  |
| Adequate and updated documentation                                                                                                                                                    |  |  |  |
| Staff can easily access such documentation when needed                                                                                                                                |  |  |  |
| <b>Record-keeping</b>                                                                                                                                                                 |  |  |  |
| The records cover all the activities and management system processes                                                                                                                  |  |  |  |
| Compliance with minimum record-keeping periods (random checks)                                                                                                                        |  |  |  |
| <b>Emergency response provisions or emergency response plan (ERP)</b>                                                                                                                 |  |  |  |
| Emergency response information or ERP, as applicable, is up to date and readily available                                                                                             |  |  |  |
| All staff is aware of the emergency response information or ERP (random checks)                                                                                                       |  |  |  |
| If an ERP has been activated, how effective was it?                                                                                                                                   |  |  |  |
| <b>Internal safety reporting procedures</b>                                                                                                                                           |  |  |  |
| Check the number of reports received since the last audit or organisational review                                                                                                    |  |  |  |
| Internal reporting and external occurrence reporting are properly performed                                                                                                           |  |  |  |
| The safety or occurrence reports are analysed                                                                                                                                         |  |  |  |
| Feedback is provided to reporters                                                                                                                                                     |  |  |  |

## BOP.ADD.035 Contracted activities

Regulation (EU) 2018/395

When contracting any part of its activity falling within the scope of this Regulation, the operator shall be responsible for ensuring that the contracted organisation carries out the activity in accordance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation. The operator shall also ensure that the competent authority is given access to the contracted organisation in order to determine that the operator is compliant with those requirements.

**AMC1 BOP.ADD.035 Contracted activities**

ED Decision 2018/004/R

**RESPONSIBILITY WHEN CONTRACTING ACTIVITIES**

- (a) The operator may decide to contract certain activities to external organisations.
- (b) A written agreement should exist between the operator and the contracted organisation clearly defining the contracted activities and the applicable requirements.
- (c) The contracted, safety-related activities relevant to the agreement should be included in the operator's safety management and compliance monitoring programmes.
- (d) The operator should ensure that the contracted organisation has the necessary resources and competence to undertake the task.

**GM1 BOP.ADD.035 Contracted activities**

ED Decision 2018/004/R

**CONTRACTING — GENERAL**

- (a) Operators may decide to contract certain activities to external organisations for the provision of services related to areas such as:
  - (1) ground handling;
  - (2) flight support;
  - (3) training; and
  - (4) manual preparation.
- (b) Contracted activities include all activities that are performed by another organisation either itself declared or certified to carry out such activities or, if not declared or certified, working under the operator's declaration.
- (c) The ultimate responsibility for the product or service provided by external organisations always remains with the operator.

**GM2 BOP.ADD.035 Contracted activities**

ED Decision 2018/004/R

**RESPONSIBILITY WHEN CONTRACTING ACTIVITIES**

- (a) Regardless of the status of the contracted organisation, the contracting operator is responsible for ensuring that all contracted activities are subject to hazard identification and risk management as required by [BOP.ADD.030\(a\)\(3\)](#), and to compliance monitoring as required by [BOP.ADD.030\(a\)\(6\)](#).
- (b) When the contracted organisation is itself declared or certified to carry out the contracted activities, the operator's compliance monitoring at least checks that the declaration effectively covers the contracted activities.

**BOP.ADD.040 Personnel requirements**

Regulation (EU) 2018/395

- (a) The operator shall appoint an accountable manager who has the authority to ensure that all activities falling within the scope of this Regulation can be financed and carried out in accordance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation. The accountable manager shall be responsible for establishing and maintaining an effective management system.
- (b) The operator shall:
  - (1) identify the responsibilities of its personnel for all tasks and activities to be performed;
  - (2) have sufficient qualified personnel to carry out those tasks and activities; and
  - (3) maintain appropriate experience, qualification and training records of its personnel.
- (c) The operator shall nominate one or more persons responsible for the management and supervision of all of the following areas:
  - (1) flight operations;
  - (2) ground operations;
  - (3) continuing airworthiness, in accordance with [Regulation \(EU\) No 1321/2014](#).

**GM1 BOP.ADD.040 Personnel requirements**

ED Decision 2018/004/R

**SMALLEST OPERATOR**

The smallest operator that can be considered is the one-person operator where all of the nominated posts are filled by the accountable manager.

**AMC1 BOP.ADD.040(c) Personnel requirements**

ED Decision 2018/004/R

**NOMINATED PERSONS**

- (a) A description of the functions and the responsibilities of the nominated persons, including their names, should be contained in the operations manual.
- (b) The operator should make arrangements to ensure continuity of supervision in the absence of nominated persons.
- (c) A person nominated by the operator, who has already been nominated by another operator, may be acceptable subject to the agreement of the competent authorities concerned.
- (d) Nominated persons should work sufficient hours to fulfil the management functions associated with the scale and scope of the operation.
- (e) One person may hold more than one of the nominated posts if such an arrangement is considered suitable and properly matched to the scale and scope of the operation.
- (f) The acceptability of a single person holding several posts, possibly in combination with being the accountable manager, should depend upon the nature and scale of the operation. The two main areas of concern should be competence and the individual's capacity to meet his or her responsibilities.

- (g) As regards competence in different areas of responsibility, there should not be any difference from the requirements applicable to persons holding only one post.
- (h) The capacity of an individual to meet his or her responsibilities should primarily be dependent upon the scale of the operation. However, the complexity of the organisation or of the operation may prevent, or limit, combinations of posts which may be acceptable in other circumstances.

## GM1 BOP.ADD.040(c) Personnel requirements

ED Decision 2018/004/R

### COMPETENCE OF NOMINATED PERSONS

- (a) Nominated persons in accordance with [BOP.ADD.040](#) possess the experience and meet the licensing provisions that are listed below in (b) to (e). Exceptionally, in particular cases, the competent authority may accept a nomination that does not meet these provisions in full. In that case, the nominee has comparable experience and also the ability to perform effectively the functions associated with the post and with the scale of the operation.
- (b) Nominated persons have:
  - (1) practical experience and expertise in the application of aviation safety standards and safe operating practices;
  - (2) comprehensive knowledge of:
    - (i) the applicable EU safety regulations and any associated requirements and procedures; and
    - (ii) the need for, and content of, the relevant parts of the operations manual; and
  - (3) 3 years of relevant work experience.
- (c) Flight operations  
The nominated person:
  - (1) holds or has held a valid flight crew licence and the associated ratings appropriate to the relevant type of operation; or
  - (2) has demonstrated in another manner thorough knowledge of the relevant flight operations.
- (d) Ground operations  
The nominated person has a thorough knowledge of the operator's ground operations concept.
- (e) Continuing airworthiness  
The nominated person has the relevant knowledge and meets the appropriate experience requirements related to balloon continuing airworthiness as detailed in [Regulation \(EU\) No 1321/2014](#)<sup>1</sup>.

<sup>1</sup> Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks (OJ L 362, 17.12.2014, p. 1).

## **BOP.ADD.045 Facility requirements**

*Regulation (EU) 2018/395*

The operator shall have facilities that are sufficient to allow for the performance and management of all tasks and activities required to ensure compliance with the essential requirements set out in Annex IV to Regulation (EC) 216/2008 and with the requirements of this Regulation.

## SECTION 2 — DECLARATION, AIRWORTHINESS AND WET AND DRY LEASE

### BOP.ADD.100 Declaration

*Regulation (EU) 2018/395*

- (a) In the declaration referred to in the second subparagraph of [Article 3\(2\)](#) the operator shall confirm that the operator complies and will continue to comply with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation.
- (b) The operator shall include in the declaration all of the following information:
  - (1) the name of the operator;
  - (2) the place where the operator has its principal place of business;
  - (3) the name and contact details of the accountable manager of the operator;
  - (4) the starting date of the commercial operation and, where relevant, the date at which the change to an existing commercial operation takes effect;
  - (5) in respect of all balloons used for the commercial operation, the balloon type, registration, main base, type of operation and continuing airworthiness management organisation.
- (c) Where applicable, the operator shall annex to the declaration the list of alternative means of compliance (AltMoC), in accordance with point [BOP.ADD.010](#).
- (d) When making the declaration, the operator shall use the form contained in the [Appendix](#) to this Annex.

### GM1 BOP.ADD.100 Declaration

*ED Decision 2018/004/R*

#### GENERAL

The intent of the declaration is to:

- (a) have the operator acknowledge its responsibilities under the applicable safety regulations and that it holds all necessary approvals;
- (b) inform the competent authority of the existence of an operator; and
- (c) enable the competent authority to fulfil its oversight responsibilities.

### BOP.ADD.105 Changes to the declaration and cessation of commercial operations

*Regulation (EU) 2018/395*

- (a) The operator shall notify the competent authority without delay of any changes in circumstances affecting its compliance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation, as declared to the competent authority, and of any changes in respect of the information referred to in point [BOP.ADD.100\(b\)](#) and the list of AltMoC referred to in point [BOP.ADD.100\(c\)](#), as included in or annexed to the declaration.

- (b) The operator shall notify the competent authority without delay when it is no longer engaged in commercial operations with balloons.

### AMC1 BOP.ADD.105(a) Changes to the declaration and cessation of commercial operations

ED Decision 2018/004/R

#### NOTIFICATION OF CHANGES

The new declaration should be submitted before the change becomes effective, indicating the date as of which the change would apply.

### BOP.ADD.110 Airworthiness requirements

Regulation (EU) 2018/395

Balloons shall have a certificate of airworthiness issued in accordance with [Regulation \(EU\) No 748/2012](#) or, in the case of a balloon registered in a third country, shall be subject to either a wet lease agreement or a dry lease agreement in accordance with point [BOP.ADD.115](#).

### BOP.ADD.115 Wet lease and dry lease of a balloon registered in a third country

Regulation (EU) 2018/395

- (a) The operator shall notify to the competent authority any wet lease agreement or dry lease agreement concerning a balloon registered in a third country.
- (b) Where a balloon registered in a third country is subject to a wet lease agreement, the operator shall ensure that the level of safety resulting from the application of the safety standards with regard to continuing airworthiness and air operations to which the third country operator of the balloon is subject, is at least equivalent to that resulting from the application of the requirements of Annex I to [Regulation \(EU\) No 1321/2014](#) and of this Regulation.
- (c) Where a balloon registered in a third country is subject to a dry lease agreement, the operator shall ensure compliance with the essential requirements relating to continuing airworthiness set out in Annexes I and IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of this Regulation.

### AMC1 BOP.ADD.115 Wet lease and dry lease of a balloon registered in a third country

ED Decision 2018/004/R

#### GENERAL

- (a) The operator intending to lease-in a third-country balloon should provide the competent authority with the following information:
- (1) the name and address of the registered owner;
  - (2) a copy of the valid certificate of airworthiness;
  - (3) a copy of the lease agreement or description of the lease provisions, except financial arrangements; and

- (4) duration of the lease.
- (b) The information mentioned above should be accompanied by a statement signed by the lessee that the parties to the lease agreement fully understand their respective responsibilities under the applicable regulations.

## **GM1 BOP.ADD.115(a) Wet lease and dry lease of a balloon registered in a third country**

*ED Decision 2018/004/R*

### **LEASE-IN AGREEMENT BETWEEN OPERATORS REGISTERED IN AN EU MEMBER STATE**

The lessee notifies to the competent authority any lease agreement between operators having their principal place of business in an EU Member State.



## SECTION 3 — MANUALS AND RECORDS

### BOP.ADD.200 Operations manual

*Regulation (EU) 2018/395*

- (a) The operator shall establish an operations manual.
- (b) The content of the operations manual shall reflect the requirements set out in this Annex and shall not contravene any information contained in the operator's declaration.
- (c) The operations manual may be established as separate parts.
- (d) All personnel of the operator shall have easy access to the portions of the operations manual that are relevant to their duties.
- (e) The operations manual shall be kept up-to-date. All personnel of the operator shall be made aware of any amendment of the operations manual that are relevant to the performance of their duties.
- (f) The operator shall ensure that any information used as the basis for the content of the operations manual and any amendment thereof is correctly reflected in the operations manual.
- (g) The operator shall ensure that all personnel are able to understand the language in which those parts of the operations manual which are relevant to their duties are written. The content of the operations manual shall be presented in a form that can be used without difficulty.

### AMC1 BOP.ADD.200 Operations manual

*ED Decision 2018/004/R*

#### GENERAL

- (a) The operations manual may vary in detail according to the complexity of the operation and of the type of balloons operated.
- (b) The operations manual, or parts thereof, may be presented in any form, including electronic form. In all cases, the accessibility, usability and reliability should be assured.
- (c) The operations manual should be such that:
  - (1) all its parts are consistent and compatible in form and content;
  - (2) it can be easily amended; and
  - (3) its content and amendment status is controlled and clearly indicated.
- (d) The operations manual should include a description of its amendment and revision process specifying:
  - (1) the person(s) who may approve amendments or revisions;
  - (2) the conditions for amendments and revisions; and
  - (3) the methods by which operator personnel are advised of the changes.
- (e) The operations manual content may be based on, or may refer to, industry codes of practice.
- (f) When compiling an operations manual, the operator may take advantage of the contents of other relevant documents. Material produced by the operator for the type-related part of the operations manual may be supplemented with, or substituted by, applicable parts of the AFM

or, where such a document exists, by an operating manual produced by the manufacturer of the balloon.

- (g) If the operator chooses to use material from another source in the operations manual, either the applicable material should be copied and included directly in the relevant part of the operations manual, or the operations manual should contain a reference to the appropriate section of that applicable material. In the latter case the operator should make available the applicable material to the personnel.
- (h) If the operator chooses to make use of material from another source (e.g. a route manual producer, a balloon manufacturer or a training organisation), this does not absolve the operator from the responsibility of verifying the applicability and suitability of this material. Any material received from an external source should be given its status by a statement in the operations manual.

## AMC2 BOP.ADD.200 Operations manual

ED Decision 2018/004/R

### CONTENT

The operations manual should include the following information, as relevant for the area and the type of operation:

- (a) table of contents;
- (b) amendment control status and list of effective pages or paragraphs, unless the entire manual is reissued and the manual has an effective date on it;
- (c) duties, responsibilities, and succession of management and operating personnel;
- (d) description of the management system;
- (e) flight time limitations;
- (f) standard operating procedures;
- (g) weather limitations;
- (h) emergency procedures;
- (i) accident and incident considerations;
- (j) personnel qualifications and training;
- (k) record-keeping;
- (l) normal flight operations;
- (m) performance operating limitations; and
- (n) handling of dangerous goods, if applicable.

## GM1 BOP.ADD.200 Operations manual

ED Decision 2018/004/R

### MORE CONSERVATIVE DATA AND PROCEDURES

The operator may decide to publish data and procedures in the operations manual which are more conservative.

## BOP.ADD.205 Record-keeping

*Regulation (EU) 2018/395*

- (a) The operator shall establish a system of record-keeping that allows adequate storage and reliable traceability of its activities.
- (b) The format of the records shall be specified in the operator's procedures or manuals.

## AMC1 BOP.ADD.205 Record-keeping

*ED Decision 2018/004/R*

### GENERAL

- (a) The record-keeping system should ensure that all records are accessible whenever needed within a reasonable time. These records should be organised in a way that ensures traceability and retrievability throughout the required retention period.
- (b) Records should be kept in paper form or in electronic format or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when the record has been created or last amended.
- (c) Paper systems should use robust material which can withstand normal handling and filing. Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the ability of unauthorised personnel to alter the data.
- (d) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data remains accessible at least through the full retention period.

## AMC2 BOP.ADD.205 Record-keeping

*ED Decision 2018/004/R*

### STORAGE PERIODS AND AVAILABILITY

- (a) The following records should be stored for at least 5 years:
  - (1) records of the activities referred to in [BOP.ADD.030](#);
  - (2) a copy of the operator's declaration;
  - (3) details of approvals held; and
  - (4) operations manual.
- (b) The following information used for the preparation and execution of a flight, and associated reports, should be stored for 3 months:
  - (1) the operational flight plan, if applicable;
  - (2) mass documentation;
  - (3) notification of special loads, including written information to the pilot-in-command about dangerous goods, if applicable; and
  - (4) flight report(s) for recording details of any occurrence, or any event that the pilot-in-command deems necessary to report or record.

- (c) Flight crew records should be stored for the periods indicated below:

|                                                          |                                                                                                 |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Flight crew licence                                      | As long as the crew member is exercising the privileges of the licence for the balloon operator |
| Flight crew member training, checking and qualifications | 3 years                                                                                         |
| Records on flight crew member recent experience          | 15 months                                                                                       |

- (d) The operator should make such records available, on request, to the crew member concerned.
- (e) The operator should preserve the information used for the preparation and execution of a flight and personnel training records, even if the operator ceases to be the operator of that balloon or the employer of that crew member, provided this is within the timescales prescribed in (c).
- (f) If a crew member becomes a crew member for another operator, the former operator should make the crew member's records available to the new operator, provided this is within the timescales prescribed in (c).
- (g) A summary of training should be maintained by the operator to show every crew member's completion of each stage of training and checking.

## SECTION 4 — FLIGHT CREW

### BOP.ADD.300 Composition of flight crew

*Regulation (EU) 2018/395*

- (a) The composition of the flight crew shall be, as a minimum, as specified in the AFM or operating limitations prescribed for the balloon.
- (b) The flight crew shall include additional flight crew members when required by the type of operation. The number of the flight crew shall not be lower than the number specified in the operations manual.
- (c) All flight crew members shall hold a licence and ratings issued or accepted in accordance with Annex I to [Regulation \(EU\) No 1178/2011](#) and appropriate to the duties assigned to them.
- (d) Flight crew members may be relieved during the flight of their duties at the controls by another suitably qualified flight crew member.
- (e) When engaging the services of flight crew members who are working on a freelance or part-time basis, the operator shall verify that all of the following requirements are complied with:
  - (1) the requirements of this Subpart;
  - (2) Annex I to [Regulation \(EU\) No 1178/2011](#), including the requirements on recent experience;
  - (3) the flight and duty time limitations and rest requirements in accordance with the national law of the Member State where the operator has its principal place of business, taking into account all services rendered by the flight crew member to other operators.

### BOP.ADD.305 Designation as pilot-in-command

*Regulation (EU) 2018/395*

- (a) The operator shall designate one pilot amongst the flight crew as pilot-in-command.
- (b) The operator shall only designate a pilot to act as pilot-in-command if he or she:
  - (1) is qualified to act as pilot-in-command in accordance with Annex I to [Regulation \(EU\) No 1178/2011](#);
  - (2) has the minimum level of experience specified in the operations manual; and
  - (3) has adequate knowledge of the area to be flown.

### BOP.ADD.310 Provision of training and checking

*Regulation (EU) 2018/395*

All training and checking of flight crew members required pursuant to point [BOP.ADD.315](#) shall be provided as follows:

- (a) in accordance with the training programmes and syllabi established by the operator in the operations manual;
- (b) by appropriately qualified persons and, as regards flight training and checking, by persons qualified in accordance with Annex I to [Regulation \(EU\) No 1178/2011](#).

**AMC1 BOP.ADD.310(a) Provision of training and checking**

ED Decision 2018/004/R

**ADDITIONAL TRAINING FOR THE PILOT-IN-COMMAND**

The pilot-in-command should complete training in first-aid and in the use of the fire extinguisher, at intervals of maximum 36 months.

**BOP.ADD.315 Recurrent training and checking**

Regulation (EU) 2018/395

- (a) Each flight crew member shall complete every 2 years recurrent flight and ground training relevant to the class of balloon on which he or she operates, including training on the location and use of all emergency and safety equipment carried.
- (b) Each flight crew member shall complete operator proficiency checks to demonstrate his or her competence in carrying out normal, abnormal and emergency procedures, covering the relevant aspects associated with the specialised tasks described in the operations manual. When carrying out those checks, due account shall be taken of crew members who undertake operations under VFR at night.
- (c) The operator proficiency check shall be valid for 24 calendar months, counting from the end of the month during which the check was carried out or, in case the check is carried out within the last 3 months of the validity period of the previous check, from the last day of the validity period of that previous check.

**AMC1 BOP.ADD.315(b);(c) Recurrent training and checking**

ED Decision 2018/004/R

**PROFICIENCY CHECK**

The operator proficiency check should be conducted by an examiner.

## SECTION 5 — GENERAL OPERATING REQUIREMENTS

### BOP.ADD.400 Responsibilities of the pilot-in-command

*Regulation (EU) 2018/395*

The pilot-in-command shall comply with both of the following:

- (a) the relevant requirements of the operator's occurrence reporting scheme referred to in point [BOP.ADD.025](#);
- (b) all flight and duty time limitations and rest requirements applicable to his or her activities in accordance with the national law of the Member State where the operator has its principal place of business.

### BOP.ADD.405 Authority of the pilot-in-command

*Regulation (EU) 2018/395*

Notwithstanding point [BOP.BAS.035](#), the operator shall take all reasonable measures to ensure that all persons carried in the balloon obey all lawful commands given by the pilot-in-command for the purpose of ensuring the safety of the balloon, of any person or property carried therein or of any person or property on the ground.

### BOP.ADD.410 Additional balloon crew member

*Regulation (EU) 2018/395*

When a balloon carries more than 19 passengers, at least one additional crew member shall be present on board the balloon in addition to the flight crew as required pursuant to points (a) and (b) of point [BOP.ADD.300](#) to assist passengers in the event of an emergency. That additional crew member shall be appropriately experienced and trained.

### AMC1 BOP.ADD.410 Additional balloon crew member

*ED Decision 2018/004/R*

#### TRAINING AND RECENCY

- (a) For training, the additional crew member should have participated in:
  - (1) three practical training inflations with subsequent flights on a balloon with a basket of a capacity of more than 19 passengers;
  - (2) at least one landing under (1) with a ground speed of at least 8 kt; and
  - (3) training in first-aid and in the use of the fire extinguisher, at intervals of maximum 36 months.
- (b) For recency, the additional crew member should perform at least 2 flights in this function in any 12-month period. Otherwise, he or she should, before resuming as additional crew member, fulfil again the training requirements of points (a)(1) and (a)(2).

## **BOP.ADD.415 Fitness relating to deep water diving and blood donation**

*Regulation (EU) 2018/395*

Crew members shall not perform any duties on the balloon where their fitness might be impaired after deep water diving or following blood donation.

## **GM1 BOP.ADD.415 Fitness relating to deep water diving and blood donation**

*ED Decision 2018/004/R*

### **ELAPSED TIME BEFORE RETURNING TO FLYING DUTY**

24 hours is a suitable minimum length of time to allow after normal recreational (sport) diving or normal blood donation before a flight. This is considered by operators when determining a reasonable time period for the guidance of crew members.

## **BOP.ADD.420 Common language**

*Regulation (EU) 2018/395*

The operator shall ensure that all crew members can communicate with each other in a common language.

## **BOP.ADD.425 Psychoactive substances**

*Regulation (EU) 2018/395*

The operator shall take all reasonable measures to ensure that no person enters or is in a balloon when under the influence of psychoactive substances to the extent that the safety of the balloon, of any person or property carried therein or of any person or property on the ground is likely to be endangered by the presence of that person.

## **BOP.ADD.430 Endangering**

*Regulation (EU) 2018/395*

The operator shall take all reasonable measures to ensure that no person, intentionally, recklessly or negligently, acts or omits to act with one of the following consequences:

- (a) endanger a balloon or person therein or on the ground;
- (b) cause or permit a balloon to endanger any person or property.

## **BOP.ADD.435 Documents, manuals and information to be carried**

*Regulation (EU) 2018/395*

- (a) All of the following documents, manuals and information shall be carried on each flight as originals or copies:
  - (1) the declaration made by the operator;
  - (2) information concerning search and rescue services for the area of the intended flight;
  - (3) the operational flight plan.



- (b) All of the following documents, manuals and information shall be stowed at a safe place, not on board the balloon during a flight, as originals:
- (1) the documents, manuals and information referred to in point (a), when copies thereof are carried on board the balloon during a flight;
  - (2) the current parts of the operations manual or the standard operating procedures (SOPs) that are relevant to the duties of crew members, which shall be easily accessible to them;
  - (3) passenger lists, when passengers are carried;
  - (4) the mass documentation referred to in point (c) of point [BOP.ADD.600](#).
- (c) When requested by the competent authority, the pilot-in-command or the operator shall make available to that authority the original documents, manuals and information within the time period specified by the authority which shall not be less than 24 hours.

## GM1 BOP.ADD.435(a)(2) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

### SEARCH AND RESCUE INFORMATION

This information is usually found in the States' aeronautical information publication.

## GM1 BOP.ADD.435(a)(3) Documents, manuals and information to be carried

*ED Decision 2018/004/R*

### OPERATIONAL FLIGHT PLAN

- (a) The operational flight plan used and the entries made may contain the following items:
- (1) balloon registration;
  - (2) date of flight;
  - (3) name of the pilot-in-command;
  - (4) place of departure;
  - (5) time of departure;
  - (6) type of operation
  - (7) balloon type;
  - (8) balloon size;
  - (9) balloon empty mass;
  - (10) mass of the traffic load;
  - (11) mass of the fuel or ballast load;
  - (12) take-off mass;
  - (13) fuel or ballast calculation;
  - (14) relevant meteorological information; and

- (15) special risk factors (e.g. power lines, wind turbines, airspace classification, etc.).
- (b) Items that are readily available in other documentation or from another acceptable source or are irrelevant to the type of operation may be omitted from the operational flight plan.

## **BOP.ADD.440 Dangerous goods**

*Regulation (EU) 2018/395*

The operator shall:

- (a) establish procedures to ensure that all reasonable measures are taken to prevent dangerous goods from being carried on board the balloon inadvertently; and
- (b) provide crew members with the necessary information enabling them to adequately carry out their duties in respect of any dangerous goods carried or intended to be carried on board the balloon.

## **GM1 BOP.ADD.440 Dangerous goods**

*ED Decision 2018/004/R*

### **PROCEDURES AND INFORMATION TO CREW MEMBERS AND PASSENGERS**

- (a) The operator provides information in the operations manual to enable the pilot-in-command and other crew members to identify which dangerous goods may be permitted on board.
- (b) Information should be given to the passengers as regards goods that are prohibited to take on board before the flight takes place. The crew may provide this information in a briefing before the flight.
- (c) Procedures are established and described in the operations manual to respond to accidents or incidents involving dangerous goods. The relevant crew members are familiar with these procedures.

## SECTION 6 — OPERATING PROCEDURES

### BOP.ADD.500 Fuel or ballast calculations

*Regulation (EU) 2018/395*

The operator shall ensure that the calculations as regards reserve fuel or ballast are documented in an operational flight plan.

### BOP.ADD.505 Carriage of special categories of passengers

*Regulation (EU) 2018/395*

The operator shall establish procedures for carrying persons requiring special conditions, assistance or devices when carried on board a balloon under conditions that ensure the safety of the balloon and of any person or property carried therein.

### BOP.ADD.510 Commercial balloon specialised operations — Standard operating procedures

*Regulation (EU) 2018/395*

Notwithstanding point [BOP.BAS.190](#):

- (a) Before commencing a commercial balloon specialised operation, the operator shall conduct a risk assessment, assessing the complexity of the intended operation in order to determine the hazards and associated risks of the operation and to establish mitigating measures where necessary.
- (b) Based on the risk assessment, the operator shall, before commencing the commercial balloon specialised operation, establish standard operating procedures (SOPs) appropriate to the intended operation and the balloon used. The SOPs shall either be part of the operations manual or be laid down in a separate document. The operator shall regularly review and update the SOPs where necessary in order to adequately take account of the risk assessment.
- (c) The operator shall ensure that commercial balloon specialised operations are performed in accordance with the SOPs.

### AMC1 BOP.ADD.510 Commercial balloon specialised operations — Standard operating procedures

*ED Decision 2018/004/R*

#### DEVELOPMENT OF STANDARD OPERATING PROCEDURES

- (a) Standard operating procedures (SOPs) should be developed to a standard format in accordance with [AMC2 BOP.ADD.510](#) and should take into account the results of the risk assessment process.
- (b) SOPs should be based on a systematic risk assessment to ensure that the risks associated with the task are acceptable. The risk assessment should describe the activity in detail, identify the relevant hazards, analyse the causes and consequences of accidental events, and establish methods to treat the associated risk.

## AMC2 BOP.ADD.510 Commercial balloon specialised operations — Standard operating procedures

ED Decision 2018/004/R

### TEMPLATE

(a) Nature and complexity of the activity

- (1) The nature of the activity and exposure. The nature of the flight and the risk exposure should be described.
- (2) The complexity of the activity. Details should be provided on how demanding the activity is with regard to the required piloting skills, the necessary level of experience, the ground support, safety and individual protective equipment that should be provided to persons involved.
- (3) The operational environment and geographical area. The operational environment and geographical area over which the operation takes place should be described:
  - (i) congested hostile environment: balloon performance standard, compliance with rules of the air, mitigation of third-party risk;
  - (ii) mountain areas: altitude, performance, the use or non-use of oxygen with mitigating procedures;
  - (iii) water areas: water state and temperature, risk of ditching, availability of search and rescue, survivability, carriage of safety equipment;
  - (iv) desert areas: carriage of safety equipment, reporting procedures, search and rescue information; and
  - (v) other areas.

(b) Equipment

All equipment required for the activity should be listed. This includes installed equipment certified in accordance with Annex I (Part-21) to [Regulation \(EU\) No 748/2012](#) as well as equipment approved in accordance with other, officially recognised standards.

(c) Crew members

- (1) The crew composition and their duties should be specified.
- (2) In addition, for flight crew members, the following should be specified:
  - (i) selection criteria (initial qualification, flight experience, experience in the activity);
  - (ii) initial training (volume and content of the training); and
  - (iii) recent experience requirement and recurrent training (volume and content of the training).
- (3) The criteria listed in (2) should take into account the operational environment and the complexity of the activity, and should be detailed in the training programmes.

(d) Performance

Details on applicable, specific performance requirements should be provided.

(e) Normal, abnormal and emergency procedures

The normal, abnormal and emergency procedures to be applied in flight and on the ground should be described.

(f) Ground equipment

Details on the nature, number and location of ground equipment required for the activity should be provided.

(g) Records

It should be determined which records specific to the flight(s) are to be kept, such as task details, balloon registration, pilot-in-command, flight times, weather and any remarks, including a record of occurrences affecting flight safety or the safety of persons or property on the ground.

## SECTION 7 — PERFORMANCE AND OPERATING LIMITATIONS

### BOP.ADD.600 System for determining the mass

*Regulation (EU) 2018/395*

- (a) The operator shall establish a system specifying how all of the following items are accurately determined for each flight, so as to enable the pilot-in-command to verify that the limitations of the AFM are complied with:
  - (1) balloon empty mass;
  - (2) mass of the traffic load;
  - (3) mass of the fuel or ballast load;
  - (4) take-off mass;
  - (5) loading of the balloon performed under the supervision of the pilot-in-command or qualified personnel;
  - (6) preparation and disposition of all documentation.
- (b) The mass computation based on electronic calculations shall be replicable by the pilot-in-command.
- (c) The mass documentation, specifying the items listed in point (a), shall be prepared prior to each flight and documented in an operational flight plan.

### AMC1 BOP.ADD.600(a)(2) System for determining the mass

*ED Decision 2018/004/R*

#### TRAFFIC LOAD, AND MASS VALUES FOR PASSENGERS AND BAGGAGE

- (a) Traffic load should be determined by actual weighing, or by calculating masses for passengers, persons other than flight crew members and baggage as follows:
  - (1) Passenger mass may be calculated on the basis of a statement by, or on behalf of, each passenger, adding to it a predetermined mass to account for hand baggage and clothing.
  - (2) The predetermined mass for hand baggage and clothing should be established by the operator on the basis of experience relevant to its particular operation. In any case, it should not be less than:
    - (i) 4 kg for clothing; and
    - (ii) 3 kg for hand baggage.
- (b) The passengers' stated mass, the mass of passengers' clothing and hand baggage should be checked prior to boarding and adjusted, if necessary.
- (c) When determining the actual mass by weighing, passengers' personal belongings and hand baggage should be included.

**AMC1 BOP.ADD.600(a)(6) System for determining the mass**

ED Decision 2018/004/R

**DOCUMENTATION**

- (a) Mass documentation should include the following:
- (1) balloon registration and type;
  - (2) date and flight identification;
  - (3) name of the pilot-in-command;
  - (4) name of the person who prepared the document;
  - (5) empty mass;
  - (6) mass of the fuel or ballast at take-off;
  - (7) load components including passengers, baggage and, if applicable, freight;
  - (8) maximum take-off mass allowed by the AFM according to temperature and altitude; and
  - (9) limiting mass values.
- (b) The mass documentation should enable the pilot-in-command to determine that the load is within the mass limits of the balloon.
- (c) The information above may be available in flight planning documents, or other documents readily available for use, or mass systems.
- (d) Any last-minute change should be brought to the attention of the pilot-in-command and entered in the documents containing the mass information. The operator should specify the maximum last-minute change allowed in passenger numbers. New mass documentation should be prepared if this maximum number is exceeded.
- (e) Where mass documentation is generated by a computerised mass system, the operator should verify the integrity of the output data at intervals not exceeding 6 months.
- (f) A copy of the final mass documentation should be made available to the pilot-in-command for his or her acceptance.

**GM1 BOP.ADD.600(a)(6) System for determining the mass**

ED Decision 2018/004/R

**LIMITING MASS VALUES**

The limiting mass values contained in the mass documentation are those stipulated in the AFM.

## Appendix

Regulation (EU) 2018/395

| <b>DECLARATION</b><br>in accordance with Commission Regulation (EU) 2018/395.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |           |                                   |                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|-----------------------------------|---------------------------------------------------------------|
| <b>Operator</b><br>Name:<br>Place where the operator has its principal place of business.<br>Name and contact details of the accountable manager:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |           |                                   |                                                               |
| <b>Balloon operation</b><br>Starting date of commercial operation and, where relevant, date of change to existing commercial operation.<br>Information on balloon(s) used, commercial operation(s) and continuing airworthiness management <sup>1</sup> :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |           |                                   |                                                               |
| Balloon type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Balloon registration | Main base | Type(s) of operation <sup>2</sup> | Continuing airworthiness management organisation <sup>3</sup> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |           |                                   |                                                               |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |           |                                   |                                                               |
| Where applicable, list of AltMoC with references to the associated AMC (annex to this declaration):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |           |                                   |                                                               |
| <b>Statements</b><br><input type="checkbox"/> The operator complies, and will continue to comply, with the essential requirements set out in Annex IV to <a href="#">Regulation (EC) No 216/2008</a> and with the requirements of <a href="#">Regulation (EU) 2018/395</a> .<br>In particular, the operator conducts its commercial operations in accordance with the following requirements of Subpart ADD of Annex II to <a href="#">Regulation (EU) 2018/395</a> :<br><input type="checkbox"/> The management system documentation, including the operations manual, comply with the requirements of Subpart ADD and all flights will be carried out in accordance with the provisions of the operations manual as required by point <a href="#">BOP.ADD.005(b)</a> of Subpart ADD.<br><input type="checkbox"/> All balloons operated either have a certificate of airworthiness issued in accordance with <a href="#">Regulation (EU) No 748/2012</a> or meet the specific airworthiness requirements applicable to balloons registered in a third country and subject to a wet lease agreement or a dry lease agreement, as required by points <a href="#">BOP.ADD.110</a> and <a href="#">BOP.ADD.115(b) and (c)</a> of Subpart ADD. |                      |           |                                   |                                                               |

<sup>1</sup> Complete the table. If there is not enough space to list the information, it shall be listed in a separate annex. The annex shall be dated and signed

<sup>2</sup> 'Type(s) of operation' refers to the type of commercial operation conducted with the balloon.

<sup>3</sup> Information about the organisation responsible for the continuing airworthiness management shall include the name of the organisation, the address and the approval reference.



- ☐ All flight crew members hold a license and ratings issued or accepted in accordance with Annex I to [Regulation \(EU\) No 1178/2011](#), as required by point [BOP.ADD.300\(c\)](#) of Subpart ADD.
- ☐ The operator will notify to the competent authority any changes in circumstances affecting its compliance with the essential requirements set out in Annex IV to [Regulation \(EC\) No 216/2008](#) and with the requirements of [Regulation \(EU\) 2018/395](#) as declared to the competent authority through this declaration and any changes to the information and lists of AltMoC included in and annexed to this declaration, as required by point [BOP.ADD.105\(a\)](#) of Subpart ADD.
- ☐ The operator confirms that all information included in this declaration, including its annexes, is complete and correct.

*Date, name and signature of the accountable manager*

## CHAPTER 2 — LICENSING

### (RESERVED)

While waiting for the envisaged new licensing rules for balloons, please refer to the [Easy Access Rules for Part-FCL](#).

## CHAPTER 3 — CONTINUING AIRWORTHINESS

### (RESERVED)

While waiting for the adoption of Part-ML (ref. [Opinion 05/2016](#)), please refer to [Easy Access Rules for Continuing Airworthiness \(Regulation \(EU\) No 1321/2014\)](#), where the current simpler and lighter regulatory requirements for the General Aviation community (GA alleviations) are marked **in violet**.

## CHAPTER 4 — INITIAL AIRWORTHINESS

As regards Part-21, please refer to the [Easy Access Rules for Airworthiness and Environmental Certification \(Regulation \(EU\) No 748/2012\)](#).

## CS-31GB (INITIAL ISSUE)

### INCORPORATED AMENDMENTS

#### CS/AMC (ED DECISIONS)

| Incorporated ED Decision               | CS/AMC Issue No,<br>Amendment No | Applicability date |
|----------------------------------------|----------------------------------|--------------------|
| <a href="#">ED Decision 2011/012/R</a> | CS-31GB/ Initial issue           | 12/12/2011         |

*Note: To access the official versions, please click on the hyperlinks provided above.*

## SUBPART A — GENERAL

### CS 31GB.1 Applicability

*ED Decision 2011/012/R*

These Certification Specifications (SCs) are applicable to manned free balloons that derive their lift from gas being lighter than air.

### CS 31GB.2 Definitions

*ED Decision 2011/012/R*

Definition of terms used:

- (a) The 'envelope' contains the medium which provides the lift.
- (b) A 'basket' is the basket, seat frame or other means suspended beneath the envelope provided for the carriage of the balloon occupants.
- (c) 'Disposable ballast' is the amount of ballast required to be available for flight path management.
- (d) 'Tethered flight' is the temporary restraint of a free balloon whilst in flight for the purposes of conducting an entire flight at a single location.
- (e) 'Launch restraint' is the temporary restraint of a free balloon for the purpose of initiating a free flight.

## SUBPART B — FLIGHT

### CS 31GB.12 Proof of compliance

*ED Decision 2011/012/R*

Each requirement of this Subpart must be met at each mass within the range of loading conditions for which certification is requested. This must be shown by:

- (a) tests upon a balloon of the type for which certification is requested or by calculations based on, and equal in accuracy to, the results of testing; and
- (b) systematic investigation of each mass if compliance cannot be reasonably inferred from the masses investigated.

### CS 31GB.14 Mass limits

*ED Decision 2011/012/R*

The range of masses over which the balloon may be safely operated must be established and at least consists of:

- (a) maximum mass

The maximum mass is the highest mass at which compliance with each applicable requirement of CS-31GB is shown. The maximum mass must be established so that it is not more than the least of:

- (1) the maximum mass selected for the product;
- (2) the design maximum mass, which is the highest mass at which each structural loading condition is shown; or
- (3) the maximum mass at which compliance with each applicable flight requirement is shown.

- (b) minimum mass

The minimum mass is the lowest mass at which compliance with each applicable flight requirement is shown.

Mass limitation information related to safe operation of the balloon must be included in the Flight Manual. (See [CS 31GB.81\(b\)\(2\)](#))

### AMC 31GB.14(a) Mass limits

*ED Decision 2011/012/R*

The maximum mass corresponds to the maximum buoyancy. The lift-producing medium is not part of the maximum mass.

### AMC 31GB.14(b) Minimum mass

*ED Decision 2011/012/R*

Minimum mass. The determination of the minimum mass should take into consideration that the controllability of the balloon might be affected by a low internal pressure at low mass.

At least the following should be demonstrated:

In landing configuration with minimum crew, untaut condition and already disposed minimum ballast, all controls (e.g. parachute, valve, rip panel, control lines, etc.) should have a positive performance and function easily and smoothly.

Note: An untaut condition is a flight with a 'slack' envelope and open appendix.

## CS 31GB.16 Empty mass

ED Decision 2011/012/R

The empty mass must be determined by weighing the balloon with installed equipment but without lifting gas.

## AMC 31GB.16 Empty mass

ED Decision 2011/012/R

The equipment and configuration that are included in the empty mass need to be specified. Refer also to [AMC 31GB.81\(b\)\(2\)](#).

## CS 31GB.17 Performance: climb

ED Decision 2011/012/R

The balloon at maximum mass must be capable of climbing at least 90 metres in the first minute from a start in equilibrium at ground level.

## AMC 31GB.17 Performance: climb

ED Decision 2011/012/R

The climb performance should be demonstrated by a test. The fully inflated balloon to maximum pressure appropriate to the conditions of the test should start from equilibrium at ground level. The climb performance should be met without excessive jettisoning of ballast.

## CS 31GB.20 Controllability

ED Decision 2011/012/R

The balloon must be safely controllable and manoeuvrable without requiring exceptional piloting skill. Associated operational limitations must be established and included in the Flight Manual. (See [CS 31GB.81\(b\)\(2\)](#)).



## SUBPART C — STRUCTURE

### CS 31GB.21 Loads

ED Decision 2011/012/R

Strength requirements are specified in terms of:

- (a) limit loads that are the maximum loads to be expected in service, taking into account the load factors of [CS 31GB.23](#); and
- (b) ultimate loads that are limit loads multiplied by factors of safety of [CS 31GB.25](#).

### CS 31GB.23 Load factor

ED Decision 2011/012/R

Flight load factor. In determining limit loads, the load factor must be at least 1.4.

### CS 31GB.25 Factors of safety

ED Decision 2011/012/R

- (a) A factor of safety must be used in the balloon design as provided in the table.

|                                                 | Safety factor |
|-------------------------------------------------|---------------|
| Envelope                                        | 5.00          |
| Suspension components (fibrous or non-metallic) | 2.25          |
| Suspension components (metallic)                | 1.50          |
| Other                                           | 1.50          |

- (b) The primary attachments of the envelope to the basket must be designed so that any single failure will not jeopardise safety of flight.
- (c) For design purposes, an occupant mass of at least 77 kg must be assumed.

### AMC 31GB.25 Factors of safety

ED Decision 2011/012/R

The term 'envelope' here includes the integral vertical and horizontal load tapes as well as the envelope fabric(s). It should be noted that the suspension system pick-up points (sometimes known as 'turnbacks') at the envelope should be regarded as part of the suspension system, rather than the envelope, as far as 31GB.25 is concerned.

'Suspension components' here are those parts of the balloon that carry the load between the lift force of the envelope and the weight force of the basket.

A net around the envelope taking these loads or suspension system pick-up points should be considered as part of the suspension system.

The individual structural elements in the suspension system should be dimensioned and configured or duplicated so that failure or absence of one structural element does not cause any uncontrollable operating condition. The factors of safety apply to all parts of the load bearing path (e.g. joints, splices, knots, terminals, etc.).

The post-single failure case only needs to be justified with the application of limit loads.

## CS 31GB.27 Strength and proof of strength

*ED Decision 2011/012/R*

- (a) The structure must be able to support limit loads without permanent deformations or other detrimental effects.
- (b) The structure must be able to withstand ultimate loads for at least 3 seconds without failure.
- (c) Proof of strength of the envelope material and other critical design features must be tested.
- (d) The basket must be of a generally robust design and afford the occupants adequate protection during a hard or fast landing. There must be no design feature that by reasonably envisaged distortion or failure would be likely to cause serious injury to the occupants.
- (e) Each item of mass that could cause an unsafe condition if it broke loose must be restrained under all loads up to the ultimate loads specified in this paragraph. The local attachments in the load path between the restrains and the structure should be designed to withstand 1.33 times the specified ultimate loads
  - Horizontal 6 g,
  - Downward 6 g,
  - Upward 2 g.
- (f) The design and strength of components must also consider the effects of recurrent and other loads experienced during transportation, ground handling and rigging.
- (g) The effect of temperature and other operating characteristics that may affect strength of the balloon must be accounted for.

## AMC 31GB.27 Strength and proof of strength

*ED Decision 2011/012/R*

Proof of compliance with the strength requirements must cover the balloon's entire operating range. Proof by calculation only can be accepted for designs where it has been demonstrated by experience that such calculation gives reliable results. Load tests need to be performed in all other cases.

## AMC 31GB.27(c) Strength and proof of strength

*ED Decision 2011/012/R*

The envelope tests may be performed on representative portions of the envelope provided the dimensions of these portions are sufficiently large to include critical design features and details such as critical seams, joints, load-attachment points, net mesh, etc. Also refer to [CS 31GB.44](#) for specific tear propagation requirements.

## AMC 31GB.27(d) Strength and proof of strength

*ED Decision 2011/012/R*

A drop test needs to be performed if it is not possible to make use of an existing proven basket of the same or similar design (in terms of construction method, size, layout, etc.) for a balloon of the size that is the subject of the application. In the absence of an alternative test proposal, this test must be performed at the maximum design mass of the basket in a manner that simulates the effects of gravity that occur as realistically as possible. The basket is dropped onto a horizontal concrete surface from a height of 1 m at 0°, 15° and 30°. The drop test should not result in deformation or fractures which, by their nature, could lead to the serious injury of occupants.

Note: It has been shown by a number of decades of in-service experience that the traditional reinforced woven wicker and willow basket design offers a combination of resilience and impact resistance that can contribute considerably to the protection of occupants. The structure is also able to absorb considerable kinetic energy during impact on the ground or against obstacles.

### AMC 31GB.27(e) Strength and proof of strength

*ED Decision 2011/012/R*

Items of mass (e.g. batteries or equipment) inside the basket or attached to the suspension system near or above the occupants should be considered because of their risk to the occupants.

Items of mass that do not cause a risk to the occupants during a hard or fast landing, but could become detached from the balloon (e.g. ballast attached to the outside of the basket), should be considered because of the potential loss of mass.

### AMC 31GB.27(f) Strength and proof of strength

*ED Decision 2011/012/R*

The strength requirements need to include consideration of loads during transport, ground handling and rigging. The loads need to be determined and the parts and components need to be designed in accordance with their designated use and dimensioned such as not to fail under recurrent loads.

## CS 31GB.28 Tethered flight loads

*ED Decision 2011/012/R*

- (a) The effects of the loads associated with tethered flight on the balloon's components and any additional equipment (if required) must be considered in the design.
- (b) The tethered restraint system must be designed so that any single failure will not jeopardise the safety of the occupants, the balloon and or third parties.
- (c) Operational limitations, associated to tethered flight, must be established and recorded in the Flight Manual. (See [CS 31GB.81\(b\)\(2\)](#))

### AMC 31GB.28(a) Tethered Flight Loads

*ED Decision 2011/012/R*

Due to the complexity of tethered flight loading, a simple analysis using configurations based on industry best practice (e.g. restraints/tether lines in a 'flat tripod' configuration with upwind and downwind v-bridles) can be used to determine the suitability of a design.

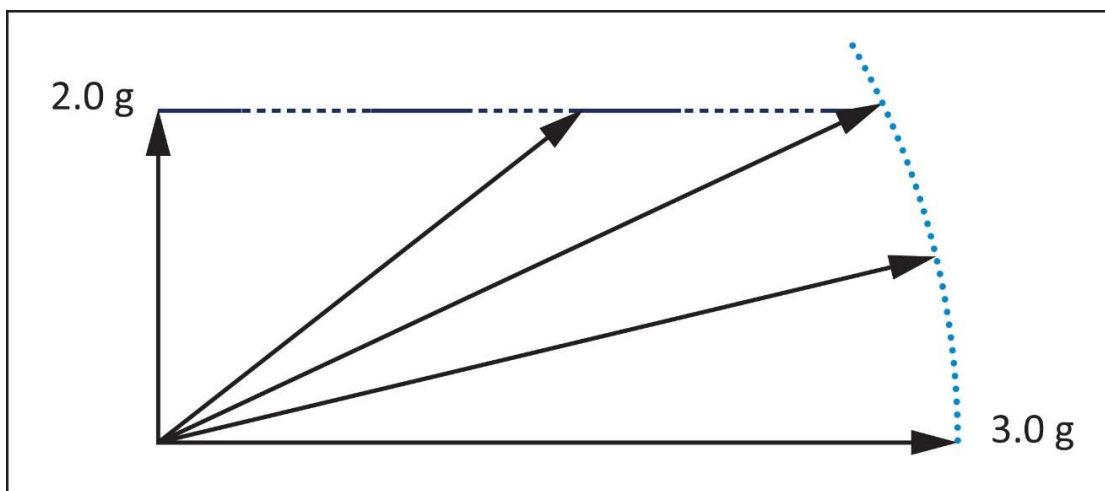
The structure needs to be designed so that stress concentrations beyond the limit of fatigue are avoided in areas where normal operation may produce varying stress.

Note: The greatest danger during tethering is if any element of the tethering equipment should fail with insufficient positive buoyancy for safe free flight. For this reason, a single point/single element tethering should not be considered.

## CS 31GB.30 Restraint harness

*ED Decision 2011/012/R*

- (a) When an occupant restraint harness is installed, the harness must not fail when subjected to loads resulting from the occupant mass submitted to the following acceleration (See Figure 1):
- (1) 2.0g Upwards
  - (2) 3.0g Horizontally in all directions.



**Figure 1: Restraint harness loads**

An occupant mass of at least 86 kg must be assumed for the purposes of this paragraph.

- (b) Local attachments in the load path between the safety belt or harness and the main structure of the basket, restraining the occupant, must be shown to be able to withstand the loads prescribed in [CS 31GB.30\(a\)](#) multiplied by a fitting factor of 1.33.

## SUBPART D — DESIGN AND CONSTRUCTION

### CS 31GB.31 General

*ED Decision 2011/012/R*

The suitability of each design detail or part that bears on safety must be established by tests or analysis.

### CS 31GB.33 Materials

*ED Decision 2011/012/R*

The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must:

- (a) be established by experience or tests; and
- (b) meet approved specifications that ensure that the materials have the strength and other properties assumed in the design data.

### AMC 31GB.33(b) Materials

*ED Decision 2011/012/R*

Approved specifications here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined applicable in the type design data. Material specifications should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities. In defining design properties, these material specification values should be modified and/or extended as necessary by the constructor to take account of manufacturing practices (for example method of construction, forming, machining and subsequent heat treatment). Also the effects of environmental conditions, such as temperature and humidity expected in service, need to be taken into account.

### CS 31GB.35 Fabrication methods

*ED Decision 2011/012/R*

The methods of fabrication used must produce a consistently sound structure. If a fabrication process requires close control to reach this objective, the process must be performed in accordance with an approved process specification.

### AMC 31GB.35 Fabrication methods

*ED Decision 2011/012/R*

Approved fabrication methods here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined in the applicable type design data. Fabrication methods should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities.

## CS 31GB.37 Fasteners

*ED Decision 2011/012/R*

- (a) Fasteners (e.g. bolts, pins, screws, karabiners) used in the structure must conform to approved specifications.
- (b) Locking methods must be established and documented.
- (c) Unless a joint is free from relative movement, secondary locking means must be used.
- (d) Self-locking nuts may not be used on bolts that are subject to rotation in service.

## AMC 31GB.37(a) Fasteners

*ED Decision 2011/012/R*

Approved specifications in the sense of these requirements are the standards described in the [AMC 31GB.33\(b\)](#).

## CS 31GB.39 Protection of parts

*ED Decision 2011/012/R*

Parts, the failure of which could adversely affect safety, must be suitably protected against deterioration or loss of strength in service due to weathering, corrosion, heat, abrasion, ground handling, ground transport, flight conditions or other causes.

## AMC 31GB.39 Protection of parts

*ED Decision 2011/012/R*

Suspension system cables and components manufactured from stainless steels (corrosion resistant steels) are considered compliant with this requirement.

To ensure the suitable protection of parts against deterioration or loss of strength, it is permissible to rely on instructions for continued airworthiness (e.g. recommended inspections or mandatory replacement of parts) (see also [CS 31GB.82](#)).

## CS 31GB.41 Inspection provisions

*ED Decision 2011/012/R*

There must be a means to allow close examination of each part that requires repeated inspection and adjustment.

## CS 31GB.43 Fitting factor

*ED Decision 2011/012/R*

- (a) A fitting factor of at least 1.15 must be used in the analysis of each fitting if the strength is not proven by limit and ultimate load tests that simulate the actual stress conditions in the fitting and surrounding structure. This factor applies to all parts of the fitting, the means of attachment, and the bearing on the structural elements joined.
- (b) Each part with an integral fitting must be treated as a fitting up to the point where the section properties become typical of the member.
- (c) The fitting factor need not be used if the joint design is made in accordance with approved practices and the safety of which is based on comprehensive test data.

## AMC 31GB.43(c) Fitting factors

*ED Decision 2011/012/R*

Approved practices here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined in the applicable type design data. Approved practices should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities.

## CS 31GB.44 Protection of envelope against tearing

*ED Decision 2011/012/R*

The design of the envelope must be such that, while supporting limit load, local damage will not grow to an extent that results in uncontrolled flight or landing.

## AMC 31GB.44 Protection of the envelope against tearing

*ED Decision 2011/012/R*

Demonstration of sufficient rip-stopping capability of the envelope material.

The objective of this demonstration is to show that the envelope material is sufficiently damage resistant. It therefore needs to be determined at what tear size the envelope material would continue to tear under the maximum tension and conditions (temperature) experienced in normal operation. In this AMC this tear size is called the critical damage.

In order to establish that the determined damage resistance is sufficient, the critical damage should be reviewed in relation to local damage foreseeable in normal operation.

The local damages to be considered are:

1. existing damage that may be undetected during pre-flight inspection, and
2. limited damage, inflicted during flight where the size of the damage in itself would not result in a catastrophic failure (e.g. a limited damage caused by hitting a branch or other basket during take off).

The resistance of envelope fabric to damage propagation should be determined by a test.

Determine the critical damage to the envelope fabric at the maximum tension experienced in service. Critical damage is the maximum damage at which growth does not occur.

Damages to be considered are:

3. a slit in the most unfavourable direction;
4. a crosswise slit in the most unfavourable directions.

### Test requirements

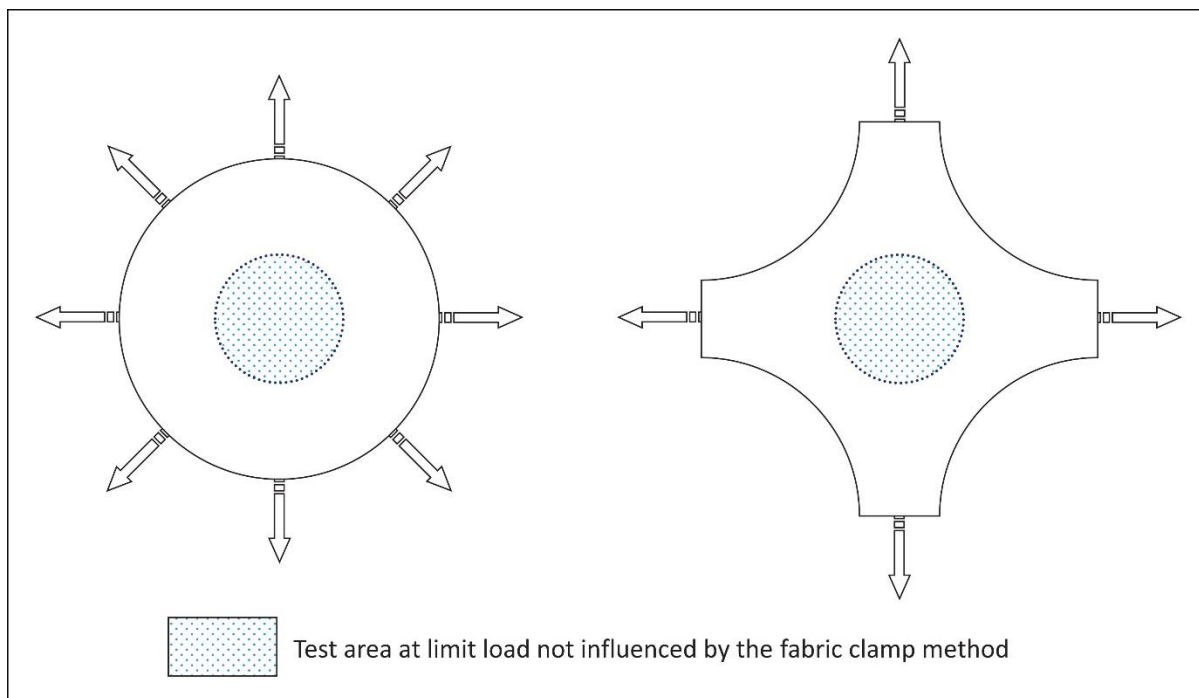
The envelope fabric should be tested at maximum tension experienced in service. The effects of temperature on the material properties must be taken into account.

The tension in the test area of the specimen of the fabric should be equal to the maximum tension experienced in service and the test method should not create unacceptable tension re-distributions in the test area when the test is conducted.

A step-wise increase of the damage (e.g. a cut with a sharp knife) should be used to determine the critical damage size.

Between the step-wise increase of the damage, enough time should be permitted for the tension re-distribution at the damage location.

The critical damage length of the material should be recorded.



**Examples of a circular or 2-directional test set-up**

#### Pre-flight inspection requirements

The design of the envelope and pre-flight inspection method should be such that a damage length considerably smaller than the critical damage length will be discovered during a pre-flight inspection. The impact of aging and operating circumstances should be considered when establishing the margin between critical damage and detectable damage. (Refer to [CS 31GB.27\(g\)](#))

Design features that could possibly hinder discovery of damage during a pre-flight inspection should be avoided or taken into consideration when the detectable damage size is determined.

Note 1: It is assumed that an envelope damage exceeding 5 cm will be detected before flight due to the loss of gas.

Note 2: The critical damage is a design property that should not be confused with acceptable damage as provided in the flight manual.

## **CS 31GB.49 Control systems**

*ED Decision 2011/012/R*

- (a) Each control must operate easily, smoothly, and positively enough to allow proper performance of its functions. Controls must be so arranged and identified to prevent confusion and inadvertent operation.
- (b) Each control system and operating device must be designed and installed in a manner that will prevent jamming, chafing, or unintended interference from passengers or loose items of equipment. The elements of the control system must have design features or must be distinctly and permanently marked to minimise the possibility of incorrect assembly that could result in malfunctioning of the control system.



- (c) The envelope must be protected against bursting using a valve or appendix.
- (d) There must be a valve to control the flight of the balloon. Proof of its reliable operation must be provided.

### AMC 31GB.49(c) Control systems

*ED Decision 2011/012/R*

The envelope is protected against bursting when it is equipped with an appendix or valve that can automatically release gas at the rate of at least 3% of the total volume per minute at the balloon's maximum operating pressure. The appendix or valve should be designed to prevent possible blockage during flight due to e.g. freezing, jamming or a reduction of the outflow opening due to deflection of the envelope and/or the outflow opening.

### CS 31GB.51 Disposable ballast

*ED Decision 2011/012/R*

- (a) Disposable ballast must have means for safe storage and release. (See also [CS 31GB.27\(e\)](#))
- (b) A minimum amount of ballast must be defined and reserved for the final landing which is sufficient (when jettisoned) to reduce the speed of descent to an acceptable value. The minimum ballast must be provided in the Flight Manual. (See [CS 31GB.81\(b\)\(2\)](#))

### AMC 31GB.51 Disposable Ballast

*ED Decision 2011/012/R*

Ballast material should be easily transferred, disposed of and dissipated. Means need to be provided to prevent freezing and/or blocking the release of the ballast material. The material should not pollute the environment.

Dry sand is a well-proven material and is considered as suitable in the sense of this paragraph and this AMC.

The disposable ballast may be necessary for the pilot to perform the flight path management. The pre-take-off decision on the amount of disposable ballast should be left to the pilot as it is dependent on the flight task, the weather, etc.

A minimum ballast quantity is considered sufficient if, when jettisoned, it stops a descent speed of 4 m/s.

Note: The shape and drag of the envelope can have an effect on minimum descent speed, resulting in a minimum descent speed above 4 m/s.

### CS 31GB.53 Drag rope

*ED Decision 2011/012/R*

If a drag rope is used, the end that is released overboard must be stiffened to preclude the probability of the rope becoming entangled with trees, wires, or other objects on the ground.

## CS 31GB.55 Rapid deflation means

*ED Decision 2011/012/R*

- (a) The envelope must have means to allow for rapid deflation after landing. The system must be designed to minimise the possibility of inadvertent operation. If a system other than a manual system is used, the reliability of the system used must be substantiated.
- (b) If a balloon is equipped with a lateral rapid deflation means, a device must be installed to align the balloon during landing in order to turn the rapid deflation means into its designated position.

## AMC 31GB.55(a) Rapid deflation means

*ED Decision 2011/012/R*

A deflation is considered as 'rapid' if after a touchdown the balloon envelope is adequately prevented from 'sailing' and being dragged too much over the ground by the wind.

## AMC 31GB.55(b) Rapid deflation means

*ED Decision 2011/012/R*

The installation of a drag rope is considered as a suitable device to align the balloon during landing in the sense of this subparagraph.

## CS 31GB.57 Control cords

*ED Decision 2011/012/R*

- (a) General
  - (1) All control cords used for flight control must be designed and installed to preclude entanglement.
  - (2) The function of control cords should be identified to the pilot and marked in accordance with paragraph (b), (c) and (d) if applicable.
  - (3) The maximum force required for their operation must not exceed 340 N.
  - (4) All control cords used for flight control must be long enough to allow for an increase of at least 10% in the vertical dimension of the envelope.
- (b) Arming cords

If an arming device is employed to prevent inadvertent operation of an irreversible control, the part of the cord to be handled by the pilot must be coloured with yellow and black bands.
- (c) Venting cords
  - (1) If a venting cord is used to allow controlled release of the lifting gas and the vent can be resealed in flight, the part of the cord to be handled by the pilot must be coloured with red and white bands.
  - (2) If a further cord is required to reseal any vent, the part of the cord handled by the pilot must be coloured white.
- (d) Rapid or emergency deflation cords
  - (1) If a cord is used for rapid or emergency deflation of the envelope and the device cannot be resealed in flight, the part of the cord to be handled by the pilot must be coloured red.

- (2) In addition to the force requirement of 31GB.57(a)(3) above, the force required to operate an emergency deflation cord must not be less than 110 N.

## CS 31GB.59 Baskets

ED Decision 2011/012/R

- (a) The basket may not rotate independently of the envelope unless:
  - (1) the rotation is under control of the pilot; and
  - (2) entanglement of operating lines is prevented.
- (b) Each projecting object on the basket, that could cause injury to the occupants, must be padded.
- (c) Occupants of a basket must be protected during hard or fast landings against:
  - (1) falling from the basket;
  - (2) serious injuries.
- (d) When more than six occupants are carried, the basket must be divided into compartments, each containing not more than six occupants.
- (e) Where basket proportions and compartmentation are such that more than one occupant may fall on top of another during landing, there must be means to minimise this possibility.
- (f) Reasonable space must be provided for all occupants, with regard to both comfort during the flight and to safety during the landing.
- (g) The space for the pilot must provide unobstructed operation in all flight phases.
- (h) There must be hand holds for each occupant.
- (i) Means must be provided to allow drainage of vapour or liquid from the bottom of the basket.
- (j) The load-bearing parts (e.g. ropes or cables) of the suspension system must be protected against damage in normal service.
- (k) The basket floor must not project beyond the sidewalls.
- (l) Limitations on the occupancy and configuration of the basket must be provided in the Flight Manual. (See [CS 31GB.81](#)).

## AMC 31GB.59(a) Baskets

ED Decision 2011/012/R

The purpose of this subparagraph is to prevent entanglement of operating lines due to uncontrolled rotation.

It should be noted that uncontrolled rotation may also occur during landings with basket tip-over if the plan view of the basket floor is circular or more than hexagonal.

## AMC 31GB.59(c) Baskets

ED Decision 2011/012/R

An internal height of the basket of 1·10 m, protecting the occupants carried from falling from the basket, is considered compliant to this requirement.

## AMC 31GB.59(e) Baskets

*ED Decision 2011/012/R*

Alignment of the basket for landing using a drag rope or an equivalent feature and Flight Manual instructions specifying that the basket should be aligned to land on one of its longer sides can be used to show compliance to this requirement. No more than two occupants may be positioned in the landing direction without means to prevent them from falling on top of each other.

## AMC 31GB.59(f) Baskets

*ED Decision 2011/012/R*

Unless otherwise justified on safety grounds, a minimum figure of between 0.25 m<sup>2</sup> and 0.3 m<sup>2</sup> plan area should be used for each standing occupant, with proper account being taken of the specified size, number and position of equipment when applying this figure. There needs to be enough space provided for passengers to take a brace position for landing. The Agency should be consulted in cases where a basket's shape or compartmentation makes the measurement of this figure subjective.

## AMC 31GB.59(h) Baskets

*ED Decision 2011/012/R*

Handholds need to be provided as an obvious means for the occupants to safely hold on to during a landing. The location or design of the handholds need to provide protection of the hands from impact during a landing.

## AMC 31GB.59(l) Baskets

*ED Decision 2011/012/R*

These limitations should state, for each permissible model of basket or other means provided for the occupants, the maximum permitted occupancy in relation to specified sizes, numbers and positions of equipment items.

## CS 31GB.61 Electrostatic discharge

*ED Decision 2011/012/R*

There must be appropriate electrostatic discharge means in the design of each balloon whose lift-producing medium contains a flammable gas to ensure that the effects of electrostatic discharge will not create a hazard.

## AMC 31GB.61 Electrostatic discharge

*ED Decision 2011/012/R*

Appropriate electrostatic discharge means are met when compliance with all of the following requirements is demonstrated.

- (a) The surface resistance on the inside of the balloon envelope after 24-hour storage at a relative air humidity of less than 50% must be value 10<sup>9</sup> Ω or lower. The values are to be determined using approved measuring methods.
- (b) The respective layer of a non-conductive material (surface resistance in excess of 10<sup>9</sup> Ω) must not be thicker than 0.3 mm unless it is enclosed by conductive layers.

- (c) The balloon envelope and all other conductive parts of the balloon (surface resistance less than  $10^9 \Omega$ ) must be conductively connected to each other (resistance of connection less than  $10^6 \Omega$ ). This requirement also applies to the joints between the panels and reinforcements.
- (d) There must be at least three independent discharge paths for the safe balance of the electrostatic charges from the inside of the envelope running to the bottom end of the basket.
- (e) The discharge paths should run on the conductive side of the envelope from top to bottom and then further down to the ground. This requirement applies to the case when the balloon is in contact with earth's surface.
- (f) Each discharge path under (d) must be of different kind or design to the other.
- (g) Periodic maintenance checks of the surface resistance and discharge paths should be included in the instructions for continued airworthiness.

Note: More detailed information can be found in:

EN 61340-5-1&2:2007 *Protection of electronic devices from electrostatic phenomena – General Requirements & User guide*

IEC 60093 *Methods of Test for Volume Resistivity and Surface Resistivity of Solid Electrical Insulating Materials*

## CS 31GB.63 Occupant restraint

ED Decision 2011/012/R

- (a) There must be a restraining means for all occupants, which can take the form of hand holds. (See [CS 31GB.59\(h\)](#))
- (b) For baskets having a separate pilot compartment, there must be a suitable restraint for the pilot which must meet the strength requirements of [CS 31GB.30](#). Additionally, the restraint must be designed so that:
  - (1) the pilot can reach all the necessary controls when the restraint is correctly worn and adjusted;
  - (2) there is a method of quick release that is simple and obvious; and
  - (3) the possibility of inadvertent release is minimised.

## CS 31GB.67 Tethered flight

ED Decision 2011/012/R

The pilot must be provided with an indication that any applicable limitations for tethered flight are being, or have been reached.

## AMC 31GB.67 Tethered flight

ED Decision 2011/012/R

The inclusion of an appropriate device or instrument (rated 'weak link', hand held anemometer, windsock, etc.) to provide the pilot with an attention-getting indication of the balloon's tethering limitation, is considered compliant with [CS 31GB.67](#).

## (SUBPART E — NOT APPLICABLE)

## SUBPART F — EQUIPMENT

### CS 31GB.71 Function and installation

*ED Decision 2011/012/R*

- (a) Each item of required equipment must:
  - (1) be of a kind and design appropriate to its intended function;
  - (2) be labelled or marked to identify its function or operating limitations, or any applicable combination of these factors;
  - (3) be installed according to limitations specified for that equipment; and
  - (4) function properly when installed.
- (b) Instruments and other equipment may not in themselves, or by their effect upon the balloon, constitute a hazard to safe operation. (See also [CS 31GB.27\(e\)](#))

### AMC 31GB.71(a)(4) Function and installation

*ED Decision 2011/012/R*

The correct functioning should not be impaired by operational circumstances such as icing, heavy rain, high humidity or low and high temperatures. The equipment, systems, and installations need to be designed to prevent hazards to the balloon in the event of a probable malfunction or failure of that equipment.

When ATC equipment and/or positioning lights as possibly required by operational rules are installed, it should be shown that the electrical system is such that the operation of this equipment is not adversely affected.

### CS 31GB.72 Miscellaneous equipment

*ED Decision 2011/012/R*

Each balloon must be equipped with a rate of climb/descent indicator (variometer).

## SUBPART G — OPERATING LIMITATIONS AND INFORMATION

### CS 31GB.81 Operating instructions

*ED Decision 2011/012/R*

- (a) Operating instructions must be furnished in a Flight Manual with each balloon.
- (b) The Flight Manual must contain:
  - (1) a description of the balloon and its technical equipment with explanatory sketches;
  - (2) operating limitations, normal procedures (including rigging, inflation, deflation and tethered flight (if applicable)), emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation. This section of the manual requires approval;
  - (3) specification of the permissible lifting gas;
  - (4) information for ground handling, transport and storage.
- (c) The operating limitations, normal and emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation must be provided to the pilot.

### AMC 31GB.81 Operating instructions

*ED Decision 2011/012/R*

- (a) It is recommended that the Specimen Flight Manual of CS-22 (AMC 22.1581) be used as guidance in the creation of a Balloon Flight Manual.
- (b) Each part of the Flight Manual that is required to be approved needs to be segregated, identified and clearly distinguished from each unapproved part of that manual.
- (c) A comprehensive list of approved basket and envelope configurations needs to be provided for each balloon model to enable operators, inspectors, etc. to easily establish an item's acceptability.
- (d) If applicable, the operating limitations, normal and emergency procedures need to include procedures and limitations for tethered flight. These procedures and limitations need to include:
  - (1) site selection, layout and assembly,
  - (2) the maximum wind speed and meteorological conditions for tethered operation,
  - (3) the MTOM (if different from free flight),
  - (4) the maximum height of the tether,
  - (5) the minimum strength of ropes, rigging, etc.,
  - (6) limitations on occupancy (if applicable).

### AMC 31GB.81(b)(2) Operating instructions

*ED Decision 2011/012/R*

The operating procedures should contain instructions necessary for the safe operation of the balloon. In particular, mitigating measures for risks of that specific type of balloon should be included.

Examples are safety instructions for flying, filling or deflating envelopes using a flammable or poisonous gas as lifting gas.

Operating procedures need to provide empty mass information required by [CS 31GB.16](#) in an unambiguous manner that will allow the verification of the balloon's mass limitations before flight.

### AMC 31GB.81(c) Operating instructions

ED Decision 2011/012/R

The operating limitations, normal and emergency procedures need to be available to the pilot during operation by providing the specific sections of the flight manual or by other means (e.g. placards, quick reference cards) that effectively accomplish the purpose.

### CS 31GB.82 Instructions for continued airworthiness

ED Decision 2011/012/R

- (a) The instructions for Continued Airworthiness must include information essential to the Continued Airworthiness of all parts and appliances of the balloon as required by CS-31GB.
- (b) The instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data provided.
- (c) The format of the manual or manuals must provide for a practical arrangement.
- (d) The instructions for Continued Airworthiness must cover:
  - (1) detailed description of the balloon and its components, systems and installations;
  - (2) handling instructions;
  - (3) basic control and operating information describing how the balloon's components, systems and installations operate;
  - (4) servicing information;
  - (5) a maintenance schedule against which the balloon must be inspected and maintained;
  - (6) maintenance and inspection instructions;
  - (7) repair instructions;
  - (8) trouble-shooting information;
  - (9) airworthiness limitations that set forth each mandatory replacement time, inspection interval and related inspection procedure. This section of the manual requires approval.

### AMC 31GB.82 Instructions for continued airworthiness

ED Decision 2011/012/R

The paragraph numbering of this AMC relates to the paragraph numbering of [CS 31GB.82](#)

- (c) If instructions for continued airworthiness are not supplied by the manufacturer or designer of parts and appliances installed in the balloon, the instructions for continued airworthiness for the balloon need to include the information essential to the continued airworthiness of the balloon.

If manuals from different manufacturers are used, they need to provide a practical arrangement.



- 
- (d)(1) The detailed description of the balloon and its components needs to include for each balloon:
- a description of the systems including the assembly and disassembly instructions;
  - a parts list covering all construction and equipment components and the assemblies. Where applicable, individual parts need to be numbered so that they can be related to the different assemblies and that their number corresponds to the type plate of the assembly;
  - a summary of the materials and consumables used with procurement details.
- (d)(5) If applicable, the maintenance schedule may include instructions for continued airworthiness (e.g. recommended inspections or mandatory replacement of parts) to ensure the suitable protection of parts against deterioration or loss of strength, objective pass or fail criteria, e.g. applicable wear tolerances need to be provided.
- (d)(6) The maintenance and inspection instructions need to provide information for removal and installation, cleaning, inspecting, adjusting, testing and lubrication of systems, parts and appliances of the balloon as required for continued airworthiness. Reference may be made to information from an accessory, instrument or equipment manufacturer as the source of this information if it is shown that the item has an exceptionally high degree of complexity requiring specialised maintenance techniques, test equipment or expertise.
- (d)(9) If the instructions for continued airworthiness consist of multiple documents, the Airworthiness Limitations section need to be included in the principal manual.

## CS-31HB (AMENDMENT 1)

### INCORPORATED AMENDMENTS

#### CS/AMC (ED DECISIONS)

| Incorporated ED Decision               | CS/AMC Issue No,<br>Amendment No | Applicability date |
|----------------------------------------|----------------------------------|--------------------|
| <a href="#">ED Decision 2011/013/R</a> | CS-31HB/ Amendment 1             | 12/12/2011         |

*Note: To access the official versions, please click on the hyperlinks provided above.*

## SUBPART A – GENERAL

### CS 31HB.1 Applicability

*ED Decision 2011/013/R*

These Certification Specifications (CSs) are applicable to manned free balloons that derive their lift from:

- (a) heated air (Hot Air Balloons)
- (b) a combination of heated air and a non flammable gas being lighter than air (Mixed Balloons, also called Rozière).

[Amdt No.: 31HB/1]

### CS 31HB.2 Definitions

*ED Decision 2011/013/R*

Definition of terms used:

- (a) The 'envelope' contains the medium which provides the lift.
- (b) A 'basket' is the basket, seat frame or other means suspended beneath the envelope for the carriage of the balloon occupants.
- (c) A 'Heater System' is the system used to heat the air to provide the lifting means of the balloon. The system includes the heat source (e.g. burner), controls, fuel lines, fuel cells, regulator, control valves and other related elements.
- (d) 'Disposable Ballast' is the amount of ballast required to be available for flight path management.
- (e) 'Tethered Flight' is the temporary restraint of a free balloon whilst in flight for the purposes of conducting an entire flight at a single location.
- (f) 'Launch Restraint' is the temporary restraint of a free balloon for the purpose of initiating a free flight.

[Amdt No.: 31HB/1]

## SUBPART B – FLIGHT

### CS 31HB.12 Proof of compliance

*ED Decision 2009/005/R*

Each requirement of this Subpart must be met at each mass within the range of loading conditions for which certification is requested. This must be shown by:

- (a) Tests upon a balloon of the type for which certification is requested or by calculations based on, and equal in accuracy to, the results of testing; and
- (b) Systematic investigation of each mass if compliance cannot be reasonably inferred from the masses investigated.

### CS 31HB.14 Mass limits

*ED Decision 2009/005/R*

The range of masses over which the balloon may be safely operated must be established and at least consists of:

- (a) Maximum mass.

The maximum mass is the highest mass at which compliance with each applicable requirement of CS-31HB is shown. The maximum mass must be established so that it is not more than the least of: (See [AMC 31HB.14\(a\)](#))

- (1) The maximum mass selected for the product;
- (2) The design maximum mass, which is the highest mass at which each structural loading condition is shown; or
- (3) The maximum mass at which compliance with each applicable flight requirement is shown.

- (b) Minimum mass.

The minimum mass is the lowest mass at which compliance with each applicable flight requirement is shown. (See [AMC 31HB.14\(b\)](#))

Mass limitations between which the balloon may be safely operated must be included in the Flight Manual. (See [CS 31HB.81\(b\)\(2\)](#))

### AMC 31HB.14(a) Mass limits

*ED Decision 2009/005/R*

The maximum mass corresponds to the maximum buoyancy. The lift-producing medium is not part of the maximum mass.

### AMC 31HB.14(b) Mass limits

*ED Decision 2009/005/R*

Minimum mass: In arriving at this figure, especially with larger balloons, attention should be paid to the ability to properly operate the balloon, in terms of both its heating and venting, with the reduced envelope rigidity associated with low mass operation.

## CS 31HB.16 Empty mass

*ED Decision 2009/005/R*

The empty mass must be determined by weighing the balloon with installed equipment but without lifting gas. (See [AMC 31HB.16](#))

## AMC 31HB.16 Empty mass

*ED Decision 2009/005/R*

The equipment and configuration that is included in the empty mass should be specified. Refer also to [AMC 31HB.81\(b\)\(2\)](#).

## CS 31HB.17 Performance: climb

*ED Decision 2009/005/R*

The balloon must be capable of climbing at least 90 metres in the first minute from a start in equilibrium at ground level. Compliance must be shown at the maximum mass appropriate to the conditions of the test. (See [AMC 31HB.17](#))

## AMC 31HB.17 Performance: climb

*ED Decision 2009/005/R*

"Conditions of the test" here refers to the combination of launch field elevation (launch altitude) and corresponding ambient air temperature. The test should be conducted at minimum specified burner fuel pressure.

## CS 31HB.20 Controllability

*ED Decision 2009/005/R*

The balloon must be safely controllable and manoeuvrable without requiring exceptional piloting skill. Associated operational limitations must be established and included in the Flight Manual. (See [CS 31HB.81\(b\)\(2\)](#))

## SUBPART C – STRUCTURE

### CS 31HB.21 Loads

ED Decision 2009/005/R

Strength requirements are specified in terms of:

- (a) limit loads that are the maximum loads to be expected in service, taking into account the load factors of [CS 31HB.23](#) and
- (b) ultimate loads that are limit loads multiplied by factors of safety of [CS 31HB.25](#).

### CS 31HB.23 Load factors

ED Decision 2009/005/R

- (a) Flight load factor. In determining limit loads, the limit load factor must be at least 1·4, except for (b).
- (b) Landing load factor. For all parts belonging to the balloon's suspension system, including the envelope to suspension system pick up points, limit load must be determined using a limit load factor of at least 3·0.

### CS 31HB.25 Factors of safety

ED Decision 2011/013/R

- (a) A factor of safety must be used in the balloon design as provided in the table.

|                                                 | Safety factor |
|-------------------------------------------------|---------------|
| Envelope                                        | 5.00          |
| Suspension components (fibrous or non-metallic) | 2.25          |
| Suspension components (metallic)                | 1.50          |
| Other                                           | 1.50          |

- (b) A reduced factor of 2 or more may be used in the envelope design if it is shown that the selected factor will preclude failure due to creep or instantaneous rupture from lack of rip stoppers. The selected factor must be applied to the more critical of the maximum operating pressure or envelope stress.
- (c) The primary attachments of the envelope to the basket must be designed so that any single failure will not jeopardise safety of flight.
- (d) For design purposes, an occupant mass of at least 77 kg must be assumed.

[Amdt No.: 31HB/1]

### AMC 31HB.25 Factors of safety

ED Decision 2011/013/R

The term "envelope" here includes the integral vertical and horizontal load tapes as well as the envelope fabric(s). It should be noted that the envelope to suspension system pick-up points (sometimes known as 'turnbacks') should be regarded as part of the suspension system, rather than the envelope, as far as [CS 31HB.25](#) is concerned.

"Suspension components" here are those components, from the base of the envelope down, upon which form the primary load paths of the trapeze, basket or other means provided for the occupants.

The individual structural elements in the suspension system should be dimensioned and configured or duplicated so that failure of one structural element (single failure) does not cause any uncontrollable operating condition. The factors of safety apply to all parts of the load bearing path (e.g. joints, splices, knots, terminals etc).

The post-single failure case should be justified with the application of limit loads.

[Amdt No.: 31HB/1]

## CS 31HB.27 Strength and proof of strength

ED Decision 2011/013/R

- (a) The structure must be able to support limit loads without permanent deformations or other detrimental effects.
- (b) The structure must be able to withstand ultimate loads for at least 3 seconds without failure.
- (c) For the balloon envelope, proof of strength must also make allowance for tear growth after damage of the envelope in order to prevent propagation of a tear to a hazardous size. (See [AMC 31HB.27\(c\)](#))
- (d) The basket must be of a generally robust design and afford the occupants adequate protection during a hard or fast landing. There must be no design feature that by reasonably envisaged distortion or failure would be likely to cause serious injury to the occupants. (See [AMC 31HB.27\(d\)](#))
- (e) The design and strength of components (particularly the burner frame/load frame) must also consider the effects of recurrent and other loads experienced during ground handling and transportation. (See [AMC 31HB.27\(e\)](#))
- (f) The effect of temperature and other operating characteristics that may affect strength of the balloon must be accounted for.
- (g) Each item of mass that could cause an unsafe condition if it broke loose must be restrained under all loads up to the ultimate loads specified in this paragraph. The local attachments in the load path between the restrains and the structure should be designed to withstand 1.33 times the specified ultimate loads (See [AMC 31HB.27\(g\)](#)):
  - 1. Horizontal 6.0g,
  - 2. Downward 6.0g,
  - 3. Upward 2.0g.

[Amdt No.: 31HB/1]

## AMC 31HB.27 Strength and proof of strength

ED Decision 2009/005/R

Proof of compliance with the strength requirements should cover the balloon's entire operating range. Proof by calculation only can be accepted for designs where it has been demonstrated by experience that such calculation gives reliable results. Load tests should be performed in all other cases.

### AMC 31HB.27(c) Strength and proof of strength

*ED Decision 2009/005/R*

For the envelope tests may be performed on representative portions of the envelope provided the dimensions of these portions are sufficiently large to include critical design features and details such as critical seams, joints, load-attachment points, etc.

### AMC 31HB.27(d) Strength and proof of strength

*ED Decision 2009/005/R*

A drop test should be performed if it is not possible to make use of an existing proven basket of the same or similar design (in terms of construction method, size, layout etc.) for a balloon of the size that is the subject of the application. In the absence of an alternative test proposal, this test should be performed at the maximum design mass of the basket in a manner that simulates the effects of gravity that occur as realistically as possible. The basket is dropped onto a horizontal concrete surface from a height of 1 m at 0°, 15° and 30°. The drop test should not result in deformation or fractures which, by their nature, could lead to the serious injury of occupants.

Note: It has been shown by a number of decades of in-service experience that the traditional reinforced woven wicker and willow basket design offers a combination of resilience and impact resistance that can contribute considerably to the protection of occupants. The structure is also able to absorb considerable kinetic energy during impact on the ground or against obstacles.

### AMC 31HB.27(e) Strength and proof of strength

*ED Decision 2009/005/R*

The strength requirements should include consideration of the ground handling case. The loads occurring in service should be determined and the parts and components under particular stress should be designed in accordance with their designated use and dimensioned such as not to fail under recurrent loads.

### AMC 31HB.27(g) Strength and proof of strength

*ED Decision 2001/013/R*

This requirement for items of mass does not apply to fuel cells that are subject to specific requirements in [CS 31HB.45\(c\)](#)

Items of mass (e.g. batteries or equipment) inside the basket or attached to the suspension system near or above the occupants should be considered because of their risk to the occupants.

Items of mass that do not cause a risk to the occupants during a hard or fast landing, but could become detached from the balloon (e.g. ballast attached to the outside of the basket in case of a mixed balloon), should be considered because of the potential loss of mass.

[Amdt No.: 31HB/1]

## CS 31HB.28 Tethered flight loads

*ED Decision 2009/005/R*

- (a) The effects of the loads associated with tethered flight on the balloon's components (particularly the burner frame/load frame) and any additional equipment (if required) must be considered in the design. (See [AMC 31HB.28\(a\)](#))



- (b) The tethered restraint system must be designed so that any single failure will not jeopardise the safety of the occupants, the balloon and or third parties.
- (c) The landing load factor and factor of safety for suspension components must be used for tethering-specific components forming part of the primary load path (e.g. forged rings, v-bridles). (See [AMC 31HB.28\(c\)](#))
- (d) Operational limitations, associated to tethered flight, must be established and recorded in the Flight Manual. (See [CS 31HB.81\(b\)\(2\)](#))

## AMC 31HB.28(a) Tethered flight loads

ED Decision 2009/005/R

Due to the complexity of tethered flight loading, a simple analysis using configurations based on industry best practice (e.g. 'restraints/tether lines in a "flat tripod" configuration with upwind and downwind v-bridles) can be used to determine the suitability of a design.

Note: The greatest danger during tethering is if any element of the tethering equipment should fail with insufficient positive buoyancy for safe free flight. For this reason single point/single element tethering should not be considered.

## AMC 31HB.28(c) Tethered flight loads

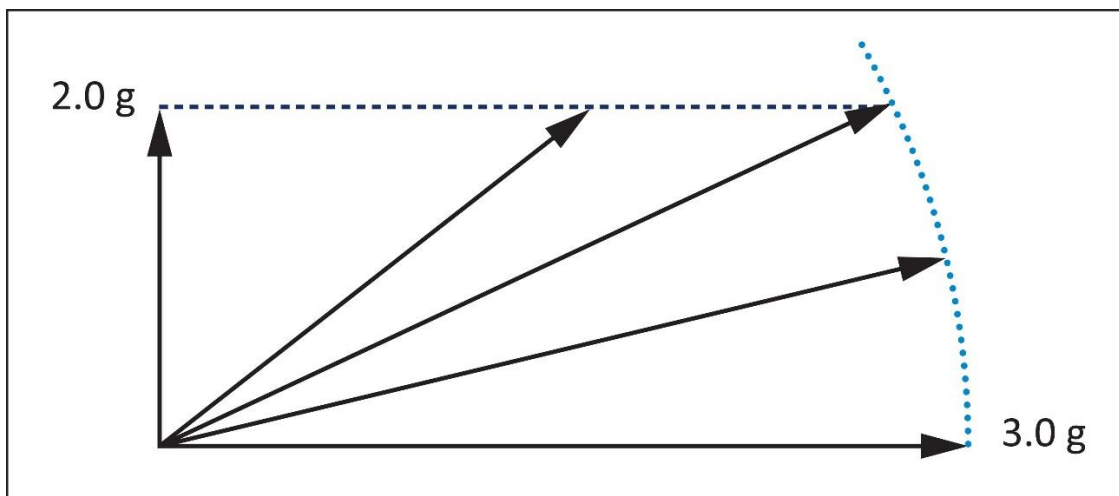
ED Decision 2009/005/R

An appropriate factor of safety is [CS 31HB.25\(a\)](#) for metallic components or [CS 31HB.25\(c\)](#) for non-metallic or fibrous suspension components.

## CS 31HB.30 Restraint harness

ED Decision 2009/005/R

- (a) When an occupant restraint harness is installed, the harness must not fail when subjected to loads resulting from the occupant mass submitted to the following acceleration (See Figure 1):
  - (1) 2.0g Upwards
  - (2) 3.0g Horizontally in all directions.



**Figure 1 Restraint harness loads**

An occupant mass of at least 86 kg must be assumed for the purposes of this paragraph.

- 
- (b) Local attachments in the load path between the safety belt or harness and the main structure of the basket, restraining the occupant, must be shown to be able to withstand the loads prescribed in [CS 31HB.30\(a\)](#) multiplied by a fitting factor of 1.33.

## SUBPART D – DESIGN AND CONSTRUCTION

### CS 31HB.31 General

*ED Decision 2009/005/R*

The suitability of each design detail or part that bears on safety must be established by tests or analysis.

### CS 31HB.33 Materials

*ED Decision 2009/005/R*

- (a) The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must
  - (1) be established by experience or tests; and
  - (2) meet approved specifications that ensure their having the strength and other properties assumed in the design data. (See [AMC 31HB.33\(a\)\(2\)](#))
- (b) Envelope materials must be shown not to support continued burning if ignited by the heater when the balloon is inflated or in flight.

### AMC 31HB.33(a)(2) Materials

*ED Decision 2009/005/R*

Approved specifications here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined applicable in the type design data. Material specifications should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities. In defining design properties these material specification values should be modified and/or extended as necessary by the constructor to take account of manufacturing practices (for example method of construction, forming, machining and subsequent heat treatment). Also the effects of environmental conditions, such as temperature and humidity, expected in service should be taken into account.

### CS 31HB.35 Fabrication methods

*ED Decision 2009/005/R*

The methods of fabrication used must produce a consistently sound structure. If a fabrication process requires close control to reach this objective, the process must be performed in accordance with an approved process specification. (See [AMC 31HB.35](#))

### AMC 31HB.35 Fabrication methods

*ED Decision 2009/005/R*

Approved fabrication methods here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined in the applicable type design data. Fabrication methods should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities.

## CS 31HB.37 Fasteners

*ED Decision 2009/005/R*

- (a) Fasteners (e.g. bolts, pins, screws, karabiners, fuel cell straps) used in the structure must conform to approved specifications. (See [AMC 31HB.37](#))
- (b) Locking methods must be established and documented.
- (c) Unless a joint is free from relative movement, secondary locking means must be used.
- (d) Self-locking nuts may not be used on bolts that are subject to rotation in service.

## AMC 31HB.37 Fasteners

*ED Decision 2009/005/R*

Approved specifications in the sense of these requirements are the standards described in the [AMC 31HB.33\(a\)](#).

## CS 31HB.39 Protection of parts

*ED Decision 2009/005/R*

Parts the failure of which could adversely affect safety must be suitably protected against deterioration or loss of strength in service due to weathering, corrosion, heat, abrasion, ground handling, ground transport, flight conditions or other causes. (See [AMC 31HB.39](#))

## AMC 31HB.39 Protection of parts

*ED Decision 2009/005/R*

Suspension system cables and components manufactured from stainless steels (corrosion resistant steels) are considered compliant with this requirement.

To ensure the suitable protection of parts against deterioration or loss of strength, it is permissible to rely on instructions for continued airworthiness (e.g. recommended inspections or mandatory replacement of parts) (See also [CS 31HB.82](#)).

## CS 31HB.41 Inspection provisions

*ED Decision 2009/005/R*

There must be a means to allow close examination of each part that requires repeated inspection and adjustment.

## CS 31HB.43 Fitting factor

*ED Decision 2009/005/R*

- (a) A fitting factor of at least 1.15 must be used in the analysis of each fitting the strength of which is not proven by limit and ultimate load tests in which the actual stress conditions are simulated in the fitting and surrounding structure. This factor applies to all parts of the fitting, the means of attachment, and the bearing on the structural elements joined.
- (b) Each part with an integral fitting must be treated as a fitting up to the point where the section properties become typical of the member.
- (c) The fitting factor need not be used if the joint design is made in accordance with approved practices and the safety of which is based on comprehensive test data. (See [AMC 31HB.43\(c\)](#))

## AMC 31HB.43(c) Fitting factors

*ED Decision 2009/005/R*

Approved practices here should be taken as being those produced by the applicant or those meeting internationally recognised standards as defined in the applicable type design data. Approved practices should be those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities.

## CS 31HB.44 Protection of envelope against tearing

*ED Decision 2011/013/R*

The design of the envelope must be such that, while supporting limit load, local damage will not grow to an extent that results in uncontrolled flight or landing.

[Amdt No.: 31HB/1]

## AMC 31HB.44 Protection of envelope against tearing

*ED Decision 2011/013/R*

Unless it can be demonstrated that basic envelope fabric has sufficient rip-stopping capability, horizontal and vertical load tapes and/or other rip-stoppers should be incorporated into the structure of the envelope so that likely tear lengths are limited to those for which level flight can be maintained. Failure of the envelope between rip-stoppers should be taken into account in the proof of the structure.

### Demonstration of sufficient rip-stopping capability of the envelope fabric.

The objective of this demonstration is to show that the envelope fabric is sufficiently damage resistant. It therefore needs to be determined at what tear size the envelope fabric would continue to tear under the maximum tension and conditions (Temperature) experienced in normal operation. In this AMC this tear size is called the critical damage.

In order to establish that the determined damage resistance is sufficient, the critical damage should be reviewed in relation to local damage foreseeable in normal operation. The local damages to be considered are:

1. Existing damage that may be undetected during pre-flight inspection, and
2. Limited damage, inflicted during flight where the size of the damage in itself would not result in a catastrophic failure. (e.g. a limited damage caused by hitting a branch or other basket during take off)

The resistance of envelope fabric to damage propagation should be determined by test.

Determine the critical damage to the envelope fabric at the maximum tension experienced in service. Critical damage is the maximum damage at which growth does not occur.

Damages to be considered are:

3. A slit in the most unfavourable direction;
4. A crosswise slit in the most unfavourable directions.

### Test requirements

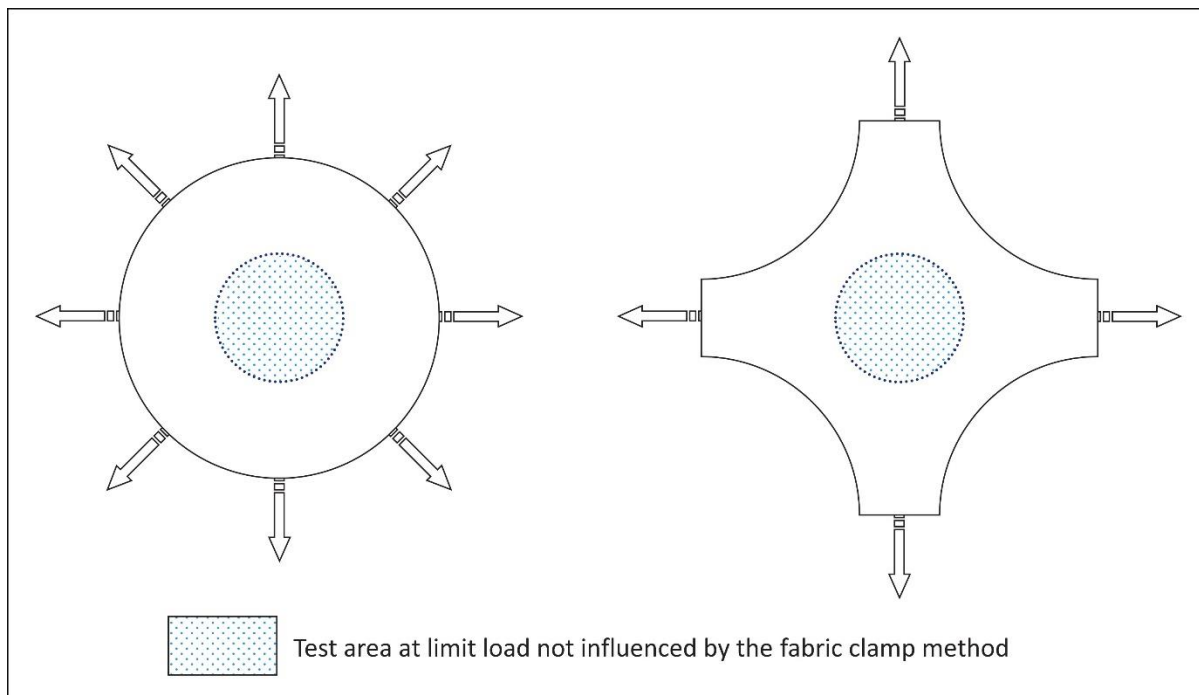
The envelope fabric should be tested at maximum tension experienced in service. The effects of temperature on the material properties must be taken into account.

The tension in the test area of the specimen of the fabric should be equal to the maximum tension experienced in service and the test method should not create unacceptable tension re-distributions in the test area when the test is conducted.

A step-wise increase of the damage (e.g. a cut with a sharp knife) should be used to determine the critical damage size.

Between the step-wise increases of the damage, enough time should be permitted for the tension re-distribution at the damage location.

The critical damage length of the material should be recorded.



**Examples of a circular or 2-directional test set-up.**

### Pre-flight inspection requirements

The design of the envelope and pre-flight Inspection method should be such that visible damage considerably smaller in length than the critical damage length can be detected during a pre-flight inspection. The impact of ageing and operating circumstances should be considered when establishing the margin between critical damage and detectable damage length (refer to [CS 31HB.27\(f\)](#)).

Design features that could possibly hinder detection of damage during a pre-flight inspection should be avoided or taken into consideration when the detectable damage length is determined.

**Note 1:** It is assumed that a visual pre-flight inspection will detect damage above 10 cm.

**Note 2:** The critical damage is a design property that should not be confused with acceptable damage as provided in the flight manual.

[Amdt No.: 31HB/1]

## CS 31HB.45 Fuel cells

ED Decision 2009/005/R

- (a) It must be demonstrated by test or analysis or both that fuel cell's have sufficient strength margins to withstand all conditions of internal and external pressures, temperatures and loads likely to be encountered in operation, including during ground handling and ground transport. (See [AMC 31HB.45\(a\)](#))
- (b) The compatibility of the cells material with the fuel must be justified. Fatigue, ageing, fire resistance and corrosion capability of the cells must be assessed and any necessary limitation, protection or maintenance action must be determined.
- (c) Fuel cells, their attachments and related supporting structure must be shown by tests to be capable of withstanding, without detrimental distortion or failure, any inertia loads to which the installation may be subjected in operation. (See [AMC 31HB.45\(c\)](#))
- (d) A pressurised fuel cell must be equipped with:
  - (1) A shut-off valve. This valve must be equipped with a self-sealing coupling, or other means to avoid the release of hazardous quantities of fuel should the control be inadvertently operated without a fuel line connected. (See [AMC 31HB.45\(d\)\(1\)](#))
  - (2) A pressure relief valve, which must protect the fuel cell against over pressurisation.
  - (3) A means to control the maximum filling.
  - (4) A means to assess the fuel quantity. (See also [CS 31HB.47\(c\)\(2\)](#))
  - (5) A data plate containing information necessary for safe operation. (See [AMC 31HB.45\(d\)\(5\)](#))
- (e) Guards must be fitted to all fuel cells to protect the valves and other fittings from fuel leakage in case of:
  - (1) Inadvertent operation and
  - (2) Damage, during normal operation, ground handling or transport.
- (f) Rigid extensions must not be fitted directly to fuel cell valves or fittings due to the likelihood of overload or fracture occurring in the case of a hard or fast landing. (See also [CS 31HB.46](#))

## AMC 31HB.45(a) Fuel cells

ED Decision 2009/005/R

The fuel cell design and manufacture should be verified by a test programme agreed by the Agency. This test programme should consider burst testing, fatigue testing, impact testing, drop testing, fire testing, macro examination of the material of the cell cylinder and welded joints (if applicable) and material variability.

Note: Road, ship or aircraft transport of fuel cells and their storage is an inherent characteristic of Hot Air Balloon operation. In order to comply with Transport and Storage legislation it is recommended to consider in parallel to airworthiness issues the compliance with such legislation applicable to pressurised gas containers (e.g. Accord européen relatif au transport international des marchandises Dangereuses par Route (ADR)).

## AMC 31HB.45(c) Fuel cells

*ED Decision 2011/013/R*

The restraint of a full fuel cell (e.g. straps) should not detach under typical high g-loads experienced during a hard or fast landing.

In case of fuel cells supported at the lower end by the basket floor or other structure, the straps and buckle restraining a fuel cell shall be designed as applicable to a horizontal limit load of 6.0g and upward limit load of 2.0g. The factor of safety of 1.50 is applicable to these fuel cell straps.

The strap and buckle design should be shown to maintain sufficient pre-tensioned after a flight to withstand the upward limit load of 2.0g. The handling of the strap and buckle shall allow proper pre-tension, reliable locking, but also easy release e.g. for emergency fuel cell removal. Industry standards like EN 12195-2, ASTM D3950 or equivalent using the appropriate strap type and grade are considered appropriate standards.

Consideration of applied loads on fuel cells should include handling and transport cases.

[Amdt No.: 31HB/1]

## AMC 31HB.45(d)(1) Fuel cells

*ED Decision 2009/005/R*

The shut-off valve should be free from restrictors (excess flow limiters or overfill protection devices) that could fail in the closed position.

## AMC 31HB.45(d)(5) Fuel cells

*ED Decision 2009/005/R*

The fuel cell data plate should include the following information:

1. the manufacturers name or mark;
2. the type design approval number (if applicable);
3. the manufacturers serial number;
4. the UN number and the proper name of the gas or mixture of gases (e.g. UN1978 Propane); and
5. the maximum filling of the receptacle with the fittings and accessories as fitted at the time of filling.

**Note:** The data plate should include, where applicable, information to allow safe filling by commercial facilities (e.g. filling by weight). Where a fuel cell has been designed to a standard which is not compatible with comparable industrial standards, the data plate should include the statement “For use in Hot Air Balloons only”.

## CS 31HB.46 Pressurised fuel systems

*ED Decision 2009/005/R*

- (a) For pressurised fuel systems each part, must be tested to, or have a safe working pressure of at least twice the maximum pressure to which the system will be subjected in normal operation. In the test, no part of the system may leak, fail or malfunction.



- (b) All parts of a pressurised fuel system must be generally robust and capable of withstanding impact and abuse loads and related deformation that are likely to occur in service. (See [AMC 31HB.46\(b\)](#))
- (c) If applicable, parts of the pressurised fuel system must be permanently marked to preclude incorrect installation.
- (d) No part of the system may have an unprotected rigid extension that could be broken in any likely impact situation. (See also [CS 31HB.45\(f\)](#)).
- (e) Where fuel systems include demountable fuel lines, a self-sealing coupling, or other means must be fitted to each outlet of each line to avoid the release of hazardous quantities of fuel should a fuel cell valve be inadvertently operated without a fuel line outlet connected.

### AMC 31HB.46(a) Pressurised fuel systems

ED Decision 2009/005/R

The pressurised fuel system parts include as applicable:

1. fuel cells;
2. lines and hoses;
3. manifolds (including T-pieces);
4. fittings.

### AMC 31HB.46(b) Pressurised fuel systems

ED Decision 2009/005/R

Connecting parts such as manifolds (including T-pieces) and hoses, between fuel cells should be designed so that they are not subject to pulling forces by significant deformation of the basket during a hard landing. Rigid extensions should be avoided in the design. If rigid extensions are used and could be broken in any likely impact situation they shall be protected.

Abuse loads likely to occur, such as the grabbing of a fuel hose by a passenger during landing or the abrasion of a fuel hose by a control line, should be considered. Hoses should be suitably reinforced (e.g. steel braiding) to withstand these conditions.

Note: Commercially available brass fittings for LPG systems should not be used as they have been shown not to have the required level of robustness.

For fuel system parts extending outside the protected area of the load frame and basket, it should be considered that they might be impacted by obstacles or abuse loads.

### AMC 31HB.46(e) Pressurised fuel systems

ED Decision 2009/005/R

“Demountable fuel lines” in the sense of this requirement are fuel lines that are linked by quick disconnect couplings.

## CS 31HB.47 Heater system

*ED Decision 2009/005/R*

- (a) The system must be designed and installed so as not to create a fire hazard.
- (b) Parts adjacent to a heater (and if applicable, its flame) and the occupants must be protected from excessive heat.
- (c) There must be controls, instruments, or other equipment essential to safe control and operation of the heater system. They must be shown to be able to perform their intended functions during normal and emergency operation.
  - (1) Where a heater system has more than one fuel supply or more than one control on each fuel supply, there must be unambiguous means to differentiate between each control, its source of supply and its function. (See [AMC 31HB.47\(c\)\(1\)](#))
  - (2) The heater system must have a device or other means to indicate the quantity of fuel available. (See [AMC 31HB.47\(c\)\(2\)](#))
  - (3) For a burner, each control system must have a device that indicates whether the heat output is high, normal or low. (See [AMC 31HB.47\(c\)\(3\)](#))
- (d) The reliability of the heater system must be substantiated by a test designed to reflect the limiting conditions likely to be encountered in service, both in kind and duration.
  - (1) For a burner, the test must include at least three flameouts and restarts.
  - (2) Each element of the system must be serviceable at the end of the test.
- (e) For a burner, the pilot light (or other means of ignition) must be shown to operate reliably in typical gusts and rain, must be readily accessible for relighting and must be easily relit. Continued operation of a heater must be possible in the event of a sustained pilot light failure.
- (f) Except in single-occupant balloons, the heater system must be designed so that in the event of any single failure, it will retain sufficient heat output to maintain level flight. (See [AMC 31HB.47\(f\)](#))

### AMC 31HB.47(c)(1) Heater system

*ED Decision 2009/005/R*

Colour coding of controls and fuel feeds is an acceptable means of compliance.

### AMC 31HB.47(c)(2) Minimum equipment

*ED Decision 2009/005/R*

An indication whether the individual fuel cell is FULL and indication for the use of the last 30% (or more) of the usable amount of fuel is considered compliant with this requirement.

### AMC 31HB.47(c)(3) Heater system

*ED Decision 2009/005/R*

A device that indicates the fuel pressure before entering each main blast valve is considered compliant with this requirement.

## AMC 31HB.47(f) Heater system

*ED Decision 2009/005/R*

For those single occupant balloons which do not meet the single failure criteria in the requirement, measures to compensate for the increased likelihood of a cold descent landing (i.e. one without the assistance of a heater system) should be discussed with the Agency.

## CS 31HB.49 Control systems

*ED Decision 2009/005/R*

- (a) Each control must operate easily, smoothly, and positively enough to allow proper performance of its functions. Controls must be so arranged and identified to prevent confusion and inadvertent operation.
- (b) Each control system and operating device must be designed and installed in a manner that will prevent jamming, chafing, or unintended interference from passengers or loose items of equipment. The elements of the control system must have design features or must be distinctly and permanently marked to minimise the possibility of incorrect assembly that could result in malfunctioning of the control system.
- (c) To prevent bursting of the envelope, each mixed balloon using a captive gas as a lifting means must be equipped with a valve or appendix through which sufficient gas volume can be released automatically once the maximum operating pressure is reached.
- (d) Each Hot Air Balloon must have a means to allow the controlled release of hot air during flight unless the balloon complies with [CS 31HB.20](#) without it.
- (e) For the purpose of envelope material protection, each Hot Air Balloon must have a means to indicate the maximum envelope skin temperature or maximum internal air temperature during operation. (See [AMC 31HB.49\(e\)](#))

## AMC 31HB.49(e) Control systems

*ED Decision 2009/005/R*

The use of a signal warning device, which actuates at a temperature below the limiting safe temperature, is an acceptable means of compliance.

If the actuation of the signal warning device is of a non-recurring type, the Flight Manual should contain appropriate instructions as to the safe operation of the balloon after the actuation of the signal warning device.

## CS 31HB.51 Disposable ballast

*ED Decision 2009/005/R*

Each mixed balloon using disposable ballast must have means for safe storage and release of the disposable ballast. (See [AMC 31HB.51](#))

## AMC 31HB.51 Disposable ballast

*ED Decision 2009/005/R*

Ballast material should be easily transferred, disposed of and dissipated. Means should be provided to prevent freezing and/or blocking the release of the ballast material. The material should not pollute the environment.

Dry sand is a well proven material and is considered as suitable in the sense of this paragraph and this AMC.

The disposable ballast may be necessary for the pilot to perform the flight path management. The pre-take-off decision on the amount of disposable ballast should be left to the pilot as it is dependent on the flight task, the weather etc.

### CS 31HB.53 Drag rope

ED Decision 2009/005/R

If a drag rope is used, the end that is released overboard must be stiffened to preclude the probability of the rope becoming entangled with trees, wires, or other objects on the ground.

### CS 31HB.55 Rapid deflation means

ED Decision 2009/005/R

- (a) The envelope must have means to allow for rapid deflation after landing. The system must be designed to minimize the possibility of inadvertent operation. If a system other than a manual system is used, the reliability of the system used must be substantiated. (See [AMC 31HB.55\(a\)](#)).
- (b) If a mixed balloon is equipped with a lateral rapid deflation means, a device must be installed to align the balloon during landing in order to turn the rapid deflation means into its designated position. (See [AMC 31HB.55\(b\)](#))

### AMC 31HB.55(a) Rapid deflation means

ED Decision 2009/005/R

A deflation is considered as "rapid" if after touch-down the balloon envelope is adequately prevented from "sailing" and being dragged too much over the ground by the wind.

### AMC 31HB.55(b) Rapid deflation means

ED Decision 2009/005/R

The installation of turning vents or a drag rope is considered as a suitable device to align the balloon during landing in the sense of this subparagraph.

### CS 31HB.57 Control cords

ED Decision 2009/005/R

- (a) General
  - (1) All control cords used for flight control must be designed and installed to preclude entanglement and inadvertent operation.
  - (2) The maximum force required for their operation must not exceed 340 N.
  - (3) All control cords used for flight control must be long enough to allow for an increase of at least 10 % in the vertical dimension of the envelope.
- (b) Arming device

If an arming device is employed to prevent inadvertent operation of an irreversible control, the part of the device to be handled by the pilot must be coloured with yellow and black bands.

(c) Turning vent cords

If turning vent cords are used to orient the balloon for landing, the part of cords to be handled by the pilot for turning to the left must be coloured black and the corresponding part of the cord used for turning to the right must be coloured green. (See [AMC 31HB.57\(c\)](#)).

(d) Venting cords

- (1) If a venting cord is used to allow controlled release of the lifting gas and the vent can be resealed in flight, the part of the cord to be handled by the pilot must be coloured with red and white bands.
- (2) If a further cord is required to re-seal any vent, the part of the cord handled by the pilot must be coloured white.

(e) Rapid or emergency deflation cords

- (1) If a cord is used for rapid or emergency deflation of the envelope and the device cannot be resealed in flight, the part of the cord to be handled by the pilot must be coloured red.
- (2) In addition to the force requirement of [CS 31HB.57\(a\)\(2\)](#) above, the force required to operate a rapid or emergency deflation cord must not be less than 110 N.

### AMC 31HB.57(c) Control cords; Turning vent cords

ED Decision 2009/005/R

In the interests of reducing the pilot's workload during the critical approach phase, it should be possible to operate the turning vents (to a sufficient extent to align the basket for landing, if this is required) with one hand.

### CS 31HB.59 Baskets

ED Decision 2011/013/R

(a) The basket may not rotate independently of the envelope unless:

- (1) the rotation is under control of the pilot; and
- (2) entanglement of operating lines is prevented.

(See [AMC 31HB.59\(a\)](#))

(b) Each projecting object on the basket, that could cause injury to the occupants, must be padded.

(c) Occupants of a basket must be protected during hard or fast landings against:

- (1) falling from the basket;
- (2) serious injuries. (See [AMC 31HB.59\(c\)](#))

(d) When more than six occupants are carried, the basket must be divided into compartments, each containing not more than six occupants.

(e) Where basket proportions and compartmentation are such that more than one occupant may fall on top of another during landing, there must be means to minimise this possibility. (See [AMC 31HB.59\(e\)](#))

(f) Reasonable space must be provided for all occupants, with regard to both comfort during the flight and to safety during the landing. (See [AMC 31HB.59\(f\)](#))

(g) The space for the pilot must provide unobstructed operation in all flight phases.

- (h) There must be hand holds for each occupant. (See [AMC 31HB.59\(h\)](#))
- (i) Means must be provided to allow drainage of vapour or liquid from the bottom of the basket.
- (j) The load-bearing parts (e.g. ropes or cables) of the suspension system must be routed in a way that excludes the possibility of them being damaged in normal service.
- (k) The basket floor must not project beyond the sidewalls.
- (l) Limitations on the occupancy and configuration of a basket must be provided in the Flight Manual. (See [CS 31HB.81](#) and [AMC 31HB.59\(l\)](#))

[Amdt No.: 31HB/1]

### AMC 31HB.59(a) Baskets

*ED Decision 2009/005/R*

The purpose of this subparagraph is to prevent entanglement of operating lines due to uncontrolled rotation.

It should be noted that uncontrolled rotation, causing entanglement of operating lines, may also occur during landings with basket tip-over if the plan view of the basket floor is circular or more than hexagonal.

### AMC 31HB.59(c) Baskets

*ED Decision 2009/005/R*

An internal height of the basket of 1.10 m, protecting the occupants carried from falling from the basket is considered compliant to this requirement.

### AMC 31HB.59(e) Baskets

*ED Decision 2009/005/R*

Alignment of the basket for landing using turning vents or a drag rope or an equivalent feature and Flight Manual instructions specifying that the basket should be aligned to land on one of its longer sides can be used to show compliance to this requirement. No more than two occupants may be positioned in the landing direction without means to prevent them from falling on top of each other.

If the plan view of the basket floor is circular or more than hexagonal, it should be noted that the basket may be rotationally unstable during fast drag landings. This may present a risk to occupants.

### AMC 31HB.59(f) Baskets

*ED Decision 2009/005/R*

Unless otherwise justified on safety grounds, a minimum figure of between 0.25 m<sup>2</sup> and 0.3m<sup>2</sup> plan area should be used for each standing occupant, with proper account being taken of the specified size, number and position of equipment when applying this figure. There should be enough space provided for passengers to take a brace position for landing. The Agency should be consulted in cases where a basket's shape or compartmentation makes the measurement of this figure subjective.

## AMC 31HB.59(h) Baskets

*ED Decision 2009/005/R*

Handholds should be provided as an obvious means for the occupants to safely hold on to during a landing. The location or design of the handholds should provide protection of the hands from impact during a landing.

## AMC 31HB.59(l) Baskets

*ED Decision 2009/005/R*

This information should state, for each permissible model of basket or other means provided for the occupants, the maximum permitted occupancy in relation to specified sizes, numbers and positions of equipment items.

## CS 31HB.63 Occupant restraint

*ED Decision 2009/005/R*

- (a) There must be a restraining means for all occupants, which can take the form of hand holds. (See [CS 31HB.59\(h\)](#))
- (b) For baskets having a separate pilot compartment, there must be a suitable restraint for the pilot which must meet the strength requirements of [CS 31HB.30](#). Additionally, the restraint must be designed so that:
  - (1) the pilot can reach all the necessary controls when the restraint is correctly worn and adjusted;
  - (2) there is a method of quick release that is simple and obvious; and
  - (3) the possibility of inadvertent release is minimised.

## AMC 31HB.63(a) Occupant restraint

*ED Decision 2009/005/R*

Note: Operational legislation may also require pilot restraint to be fitted to balloons which have a single compartment basket.

## CS 31HB.67 Tethered flight

*ED Decision 2009/005/R*

The pilot must be provided with an indication that any applicable limitations for tethered flight are being, or have been reached. (See [AMC 31HB.67](#))

## AMC 31HB.67 Tethered flight

*ED Decision 2009/005/R*

The inclusion of an appropriate device or instrument (rated "weak link", hand held anemometer, windsock etc.) to provide the pilot with an attention-getting indication of the balloon's tethering limitation, is considered compliant with [CS 31HB.67](#).

## SUBPART F – EQUIPMENT

### CS 31HB.71 Function and installation

ED Decision 2009/005/R

- (a) Each item of required equipment must:
  - (1) be of a kind and design appropriate to its intended function;
  - (2) be labelled or marked to identify its function or operating limitations, or any applicable combination of these factors;
  - (3) be installed according to limitations specified for that equipment; and
  - (4) function properly when installed. (See [AMC 31HB.71\(a\)\(4\)](#))
- (b) Instruments and other equipment may not in themselves, or by their effect upon the balloon, constitute a hazard to safe operation.

### AMC 31HB.71(a)(4) Function and installation

ED Decision 2009/005/R

The correct functioning should not be impaired by operational circumstances such as icing, heavy rain, high humidity or low and high temperatures. The equipment, systems, and installations should be designed to prevent hazards to the balloon in the event of a probable malfunction or failure of that equipment.

When ATC equipment and/or positioning lights as possibly required by operational rules are installed, it should be shown that the electrical system is such that the operation of this equipment is not adversely affected by operational circumstances.

### CS 31HB.72 Miscellaneous equipment

ED Decision 2011/013/R

Each balloon must be equipped with:

- (a) General:
  - (1) A standby source of ignition for the pilot light or burner.
  - (2) An envelope temperature indicator, which may either be of the continuous reading type or a type that gives a warning signal. (See also [CS 31HB.49\(e\)](#))
  - (3) Where flight manual limitations specify a rate of climb or descent; a rate of climb/descent indicator (variometer).
  - (4) A fire extinguisher. (See [AMC 31HB.72\(a\)\(4\)](#))
- (b) A 'kit' of tethering components, if the balloon is specifically approved for tethered operations. (See [CS 31HB.28](#))
- (c) For mixed balloons minimum ballast, if applicable.

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## AMC 31HB.72(a)(4) Miscellaneous equipment

*ED Decision 2011/013/R*

Fire extinguishers should:

- (i) conform to EN3 or an equivalent specification acceptable to the Agency;
- (ii) have a minimum capacity of 2 kg when using dry powder, or when the extinguishing means is other than dry powder be at least of comparable effect and capacity.

[Amdt No.: 31HB/1]

## SUBPART G – OPERATING LIMITATIONS AND INFORMATION

### CS 31HB.81 Operating instructions

*ED Decision 2009/005/R*

(See [AMC 31HB.81](#))

- (a) Operating instructions must be furnished in a Flight Manual with each balloon.
- (b) Flight Manual Information and Approval. The Flight Manual must contain:
  - (1) A description of the balloon and its technical equipment with explanatory sketches;
  - (2) Operating limitations, normal procedures (including rigging, inflation and deflation), emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation. This section of the manual requires approval (See [AMC 31HB.81\(b\)\(2\)](#));
  - (3) Specification of the permissible lifting gas (for mixed balloons only); and
  - (4) Information for ground handling, transport and storage.
- (c) The operating limitations, normal and emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation must be provided to the pilot. (See [AMC 31HB.81\(c\)](#))

### AMC 31HB.81 General

*ED Decision 2009/005/R*

- (i) It is recommended that the Specimen Flight Manual of CS-22 (AMC 22.1581) be used as guidance in the creation of a Balloon Flight Manual.
- (ii) Each part of the Flight Manual that is required to be approved should be segregated, identified and clearly distinguished from each unapproved part of that manual.
- (iii) A comprehensive list of approved basket, burner and envelope configurations should be provided for each balloon model, to enable operators, inspectors etc. to easily establish an item's acceptability.
- (iv) If applicable, the operating limitations, normal and emergency procedures should include procedures and limitations for tethered flight. These procedures and limitations should include:
  - (1) site selection, layout and assembly;
  - (2) the maximum wind speed and meteorological conditions for tethered operation;
  - (3) the MTOM (if different from free flight);
  - (4) the maximum height of the tether;
  - (5) the minimum strength of ropes, rigging etc.;
  - (6) limitations on occupancy (if applicable).

### AMC 31HB.81(b)(2) General

*ED Decision 2009/005/R*

Operating procedures should provide empty mass information required by [CS 31HB.16](#) in an unambiguous manner that will allow the verification of the balloon's mass limitations before flight.

## AMC 31HB.81(c) General

*ED Decision 2009/005/R*

The operating limitations, normal and emergency procedures should be available to the pilot during operation by providing the specific sections of the flight manual or by other means (e.g. placards, quick reference cards) that effectively accomplish the purpose.

## CS 31HB.82 Instructions for continued airworthiness

*ED Decision 2009/005/R*

- (a) The instructions for Continued Airworthiness must include information essential to the Continued Airworthiness of all parts and appliances of the balloon as required by CS-31HB.
- (b) The instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data provided.
- (c) The format of the manual or manuals must provide for a practical arrangement. (See [AMC 31HB.82\(c\)](#))
- (d) The instructions for Continued Airworthiness must cover:
  - (1) a detailed description of the balloon and its components, systems and installations; (See [AMC 31HB.82\(d\)\(1\)](#))
  - (2) handling instructions;
  - (3) basic control and operating information describing how the balloon's components, systems and installations operate;
  - (4) servicing information;
  - (5) a maintenance schedule against which the balloon must be inspected and maintained; (See [AMC 31HB.82\(d\)\(5\)](#))
  - (6) maintenance and inspection instructions; (See [AMC 31HB.82\(d\)\(6\)](#))
  - (7) repair instructions;
  - (8) trouble-shooting information; and
  - (9) airworthiness limitations that set forth each mandatory replacement time, inspection interval and related inspection procedure. This section of the manual requires approval. (See [AMC 31HB.82\(d\)\(9\)](#))

## AMC 31HB.82(c) Instructions for continued airworthiness

*ED Decision 2009/005/R*

- (i) If instructions for continued airworthiness are not supplied by the manufacturer or designer of parts and appliances installed in the balloon, the instructions for continued airworthiness for the balloon should include the information essential to the continued airworthiness of the balloon.
- (ii) If manuals from different manufacturers are used they should provide a practical arrangement.

### **AMC 31HB.82(d)(1) Instructions for continued airworthiness**

*ED Decision 2009/005/R*

The detailed description of the balloon and its components should include for each balloon:

- (i) a description of the systems including the assembly and disassembly instructions;
- (ii) a parts list covering all construction and equipment components and the assemblies. Where applicable individual parts should be numbered so that they can be related to the different assemblies and that their number corresponds to the type plate of the assembly;
- (iii) a summary of the materials and consumables used with procurement details.

### **AMC 31HB.82(d)(5) Instructions for continued airworthiness**

*ED Decision 2009/005/R*

If applicable the maintenance schedule may include instructions for continued airworthiness (e.g. recommended inspections or mandatory replacement of parts) to ensure the suitable protection of parts against deterioration or loss of strength, objective pass or fail criteria e.g. applicable wear tolerances should be provided.

### **AMC 31HB.82(d)(6) Instructions for continued airworthiness**

*ED Decision 2009/005/R*

The maintenance and inspection instructions should provide information for removal and installation, cleaning, inspecting, adjusting, testing and lubrication of systems, parts and appliances of the balloon as required for continued airworthiness. Reference may be made to information from an accessory, instrument or equipment manufacturer as the source of this information if it is shown that the item has an exceptionally high degree of complexity requiring specialised maintenance techniques, test equipment or expertise.

### **AMC 31HB.82(d)(9) Instructions for continued airworthiness**

*ED Decision 2009/005/R*

If the instructions for continued airworthiness consist of multiple documents, the Airworthiness Limitations section should be included in the principal manual.

## CS-31TGB (INITIAL ISSUE)

### INCORPORATED AMENDMENTS

### CS/AMC (ED DECISIONS)

| Incorporated ED Decision               | CS/AMC Issue No,<br>Amendment No | Applicability date |
|----------------------------------------|----------------------------------|--------------------|
| <a href="#">ED Decision 2013/011/R</a> | CS-31TGB/ Initial issue          | 1/7/2013           |

*Note: To access the official versions, please click on the hyperlinks provided above.*

## SUBPART A — GENERAL

### CS 31TGB.1 Applicability

*ED Decision 2013/011/R*

These Certification Specifications (CSs) are applicable to non-free flying manned tethered gas balloons that operate up to a maximum altitude of 500 m above the surface, and that derive their lift from non-flammable gas being lighter than air.

### CS 31TGB.2 Definitions

*ED Decision 2013/011/R*

Definition of terms and principles used:

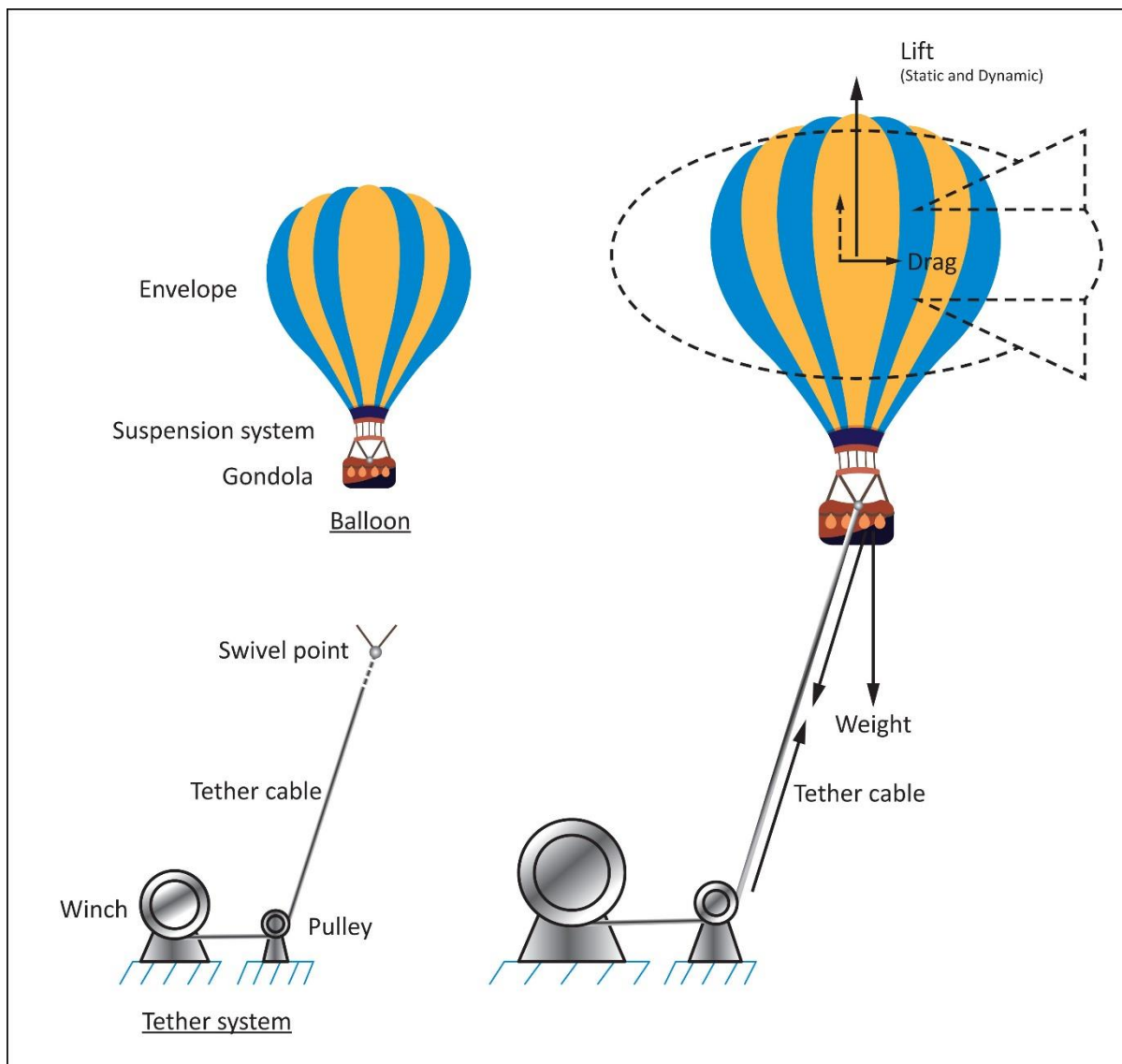
- (a) A tethered gas balloon consists of a balloon system (envelope, suspension system and gondola) and a tether system that continuously anchors it during operation.
- (b) The tether system (winch, pulley, cable and swivel point) includes all components affected by forces resulting from tethering up to and including interface parts with the foundation or counterweight.
- (c) The mooring system includes all components affected by forces resulting from the applicable types of mooring (e.g. high and/or low mooring).
- (d) The suspension system includes all components suspending the gondola to the envelope (if applicable including the net).
- (e) A gondola is a basket or other device (e.g. container, trapeze, harness, seat or platform) suspended beneath the envelope to accommodate the balloon occupants.
- (f) The envelope contains the lifting gas.
- (g) The swivel point is the connection between the tether system and balloon system allowing rotation of the balloon independent from the tether cable.
- (h) Ascent/descent system is the part of the tether system raising and lowering the balloon.
- (i) The maximum lift is the sum of the maximum static lift from the lifting gas volume and the maximum dynamic lift, at sea level in International Standard Atmosphere conditions.
- (j) The maximum dynamic lift is the highest lift force at the chosen maximum operating wind condition at sea level in International Standard Atmosphere conditions.

## AMC1 31TGB.2 Definitions

ED Decision 2013/011/R

The illustration below shows a typical example of the various systems, parts and forces of the tethered gas balloon in order to distinct their function as provided in the definitions.

Note: Lift\*<sub>Dynamic</sub> is disregarded for load cases of spherical envelope shapes.



## SUBPART B — FLIGHT

### CS 31TGB.12 Proof of compliance

*ED Decision 2013/011/R*

Each requirement of this Subpart is met at each mass and lift combination within the operating conditions for which certification is requested. This is shown by:

- (a) Tests upon a balloon of the type for which certification is requested or by calculations based on, and equal in accuracy to, the results of testing; and
- (b) Systematic investigation of each mass and lift combination if compliance cannot be reasonably inferred from the masses investigated.

### CS 31TGB.14 Mass limits

*ED Decision 2013/011/R*

The range of masses over which the balloon may be safely operated is established and at least consists of:

- (a) Maximum mass.

The maximum mass is the highest mass at which compliance with each applicable requirement of CS-31TGB is shown. The maximum mass is established so that it is not more than the least of:

- (1) the maximum mass selected for the product; or
- (2) the design maximum mass, which is the highest mass at which each structural loading condition is shown.

- (b) Minimum mass:

The minimum mass is the lowest mass at which compliance with the structural loading requirement is shown for the tether system.

- (c) Mass limitation information related to safe operation of the balloon are included in the Flight Manual. (See [CS 31TGB.81\(b\)\(2\)](#))

### AMC1 31TGB.14 Mass limits

*ED Decision 2013/011/R*

#### Maximum mass

The maximum mass results in a weight force that is equal or lower to the maximum static lift force. The lift-producing medium is not part of the maximum mass.

For each structural loading case the maximum mass is established. The maximum mass consists of the balloon and the length of the tether cable, which weight force acts upon the balloon in the specific load case.

The maximum design mass of the product is the least of the maximum masses established for the load cases or a lower maximum mass if so selected by the applicant.

#### Minimum mass

The minimum mass is the mass that results in the highest loading in the tether system under the following conditions for which compliance to the structural requirements is shown:



1. Maximum deceleration during ascent
2. Maximum static lift
3. Maximal permissible wind speed of operation

Since the mass increases with the extension of the tether cable, the critical case for the minimum mass is reached at the beginning of the ascent.

Mass limitations and information, e.g. pay load are established from the maximum and minimum masses and provided in the Flight Manual.

## CS 31TGB.20 Controllability

ED Decision 2013/011/R

- (a) The balloon is safely controllable and manoeuvrable without requiring exceptional skill. Associated operational limitations are established and included in the Flight Manual. (See [CS 31TGB.81\(b\)\(2\)](#))
- (b) The continuing controllability of the balloon or other mitigations are provided to give each occupant every reasonable chance of escaping serious injury in the following emergency conditions:
  - (1) Potential or unintended free flight.
  - (2) Terminating operation in wind conditions exceeding the operating limitations by 50 %.
  - (3) Tether system failure that prevents descent from the maximum operating height or any other height if considered more critical.

## AMC1 31TGB.20(b) Controllability

ED Decision 2013/011/R

It is established by analysis that the hazards from the specified emergency conditions are mitigated by design or procedures. Failure modes that can result in an unintended free flight of the balloon with occupants are included in this analysis.

A suitable device (e.g. electronic altitude pressure switch combined with an ascent velocity detector) ensuring that the envelope does not burst and a lifting gas valve is operated such that a descent occurs in a manageable manner is regarded as acceptable.

A suitable procedure describes all necessary measures to be taken for the recovery.

If procedures for these emergency conditions are not covered by the normal operating procedures they are included in the Flight Manual.

## SUBPART C — STRUCTURE

### CS 31TGB.21 Loads

ED Decision 2013/011/R

Strength requirements are specified in terms of:

- (a) limit loads that are the maximum loads to be expected in service, taking into account the load factors of [CS 31TGB.23](#); and
- (b) ultimate loads that are limit loads multiplied by factors of safety defined in [CS 31TGB.25](#).

### CS 31TGB.22 In-Service load cases

ED Decision 2013/011/R

The strength requirements include consideration of the applicable in-service load cases such as:

- 1. inflation;
- 2. flight; and
- 3. mooring.

The loads are determined and the parts and components under particular stress designed in accordance with their designated use and dimensioned such as not to fail under recurrent loads.

### AMC1 31TGB.22 In-Service load cases

ED Decision 2013/011/R

#### Inflation/mooring

The 'inflation and mooring cases' referred to in this requirement cover assembly, disassembly, inflation, deflation and mooring load cases. Mooring load cases cover both low and high mooring, if applicable.

When the balloon is moored in the parking position (low mooring) the maximum gas pressure in the envelope is normally identical to the 'maximum gas pressure' established for any of the flight conditions. If the low mooring operation, however, allows for a precautionary increased pressure of the gas in the envelope this load case is also considered.

#### Flight

Flight load cases cover the operation within the established limitations (temperature, wind speed, mass, and ascent/descent speed limitations). A dynamic lift component is considered in the load cases for the sudden deceleration of the ascent/descent unit and when the envelope shape is not spherical and generates lift in wind conditions. When a dynamic lift component is applicable, gust loads are considered as well as potential oscillation behaviour of the balloon and the tether caused by airflow and from variations in the lift component and its centre of pressure.

## CS 31TGB.23 Load factors

ED Decision 2013/011/R

- (a) Flight load factor. In determining limit load, the flight load factor is at least 1·4, except for (b).
- (b) Ascent load factor. In determining limit load on the tether system, the ascent load factor appropriate for the type of operation is established and applied to the static load cases on the tether system.
- (c) Gust load factor. In determining limit load, the gust load factor is established for the effect of gusts as defined in the operating limitations.

## AMC1 31TGB.23(b) Ascent load factors

ED Decision 2013/011/R

The ascent load factor is applied to the static tether system load to cover dynamic loads to the tether system resulting from decelerations during the ascent. The maximum deceleration typically occurs when an emergency stop is made during maximum ascent speed. The highest loads are typically experienced when this occurs at maximum static lift and minimum balloon weight and minimum deceleration travel. Minimum balloon weight and minimum deceleration travel coincide at low tether cable length when the mass of the tether cable is the lowest and the elongation or slack of the tether cable are the lowest.

For an ascent speed below 1 m/sec, an ascent load factor of 2 is acceptable.

## AMC1 31TGB.23(c) Gust load factor

ED Decision 2013/011/R

A gust load factor is applicable to balloons that due to the shape of the envelope generate aerodynamic lift forces in gust conditions. The gust load for spherical balloons is, therefore, 1 and is considered to have no influence on the loads.

## CS 31TGB.25 Factors of safety

ED Decision 2013/011/R

- (a) A factor of safety is used in the balloon system design as provided in the table.

|                                                                               | Safety factor |
|-------------------------------------------------------------------------------|---------------|
| Envelope                                                                      | 5·00          |
| Suspension and tethering components (fibrous or non-metallic)                 | 3·50          |
| Suspension and tethering components (metallic)                                | 2·50          |
| Other (This includes mooring components not used for suspension or tethering) | 1·50          |

- (b) Regardless of the materials used, the load-bearing components of the suspension and tethering system is designed so that failure of any single component will not jeopardise safety of flight, and that total failure is extremely remote. Account is taken of any reasonably foreseeable dynamic or asymmetric loading affects associated with the initial element's failure.
- (c) Where no provision is made for duplication in the suspension or tether system, the factor of safety is to be multiplied by a factor of 1·5.
- (d) For design purposes, an occupant mass of at least 77 kg is assumed.

## AMC1 31TGB.25(b) Factors of safety

*ED Decision 2013/011/R*

The dynamic loads on a balloon system are difficult to evaluate because metal or textile parts behave quite different.

In absence of a more suitable method or as replacement of a load test, the failure of the load bearing component shall be shown by the following method:

Multiply the limit load in the failing load path by two and distribute it as a static load among the remaining load paths.

For conventional designs, this is an appropriate method which is based on good service experience.

## CS 31TGB.27 Strength and proof of strength

*ED Decision 2013/011/R*

- (a) The structure is able to support limit loads without permanent deformation or other detrimental effects.
- (b) The structure is able to withstand ultimate loads for at least 3 seconds without failure.
- (c) Proof of strength of the envelope material and other critical design features are tested.
- (d) The gondola is of a generally robust design and provides the occupants adequate protection during a hard landing.
- (e) The design and strength of components also considers the effects of recurrent and other loads experienced during transportation, ground handling, and mooring.
- (f) The effect of temperature and other environmental conditions that may affect strength of the balloon is accounted for.

## AMC1 31TGB.27(c) Strength and proof of strength

*ED Decision 2013/011/R*

The envelope tests may be performed on representative portions of the envelope provided the dimensions of these portions are sufficiently large to include critical design features and details such as critical seams, joints, load-attachment points, net mesh, etc. Also refer to [CS 31TGB.45](#) for specific tear propagation requirements.

## AMC1 31TGB.27(e) Strength and proof of strength

*ED Decision 2013/011/R*

The strength requirements need to include consideration of loads during transport, ground handling and rigging. The loads need to be determined and the parts and components need to be designed in accordance with their designated use and dimensioned such as not to fail under recurrent loads.

## SUBPART D — DESIGN AND CONSTRUCTION

### CS 31TGB.31 General

*ED Decision 2013/011/R*

The suitability of each design detail or part that bears on safety is established by tests or analysis.

### CS 31TGB.33 Materials

*ED Decision 2013/011/R*

The suitability and durability of materials used for parts, the failure of which could adversely affect safety:

- (a) are established by experience or tests; and
- (b) meet approved specifications that ensure that the materials have the strength and other properties assumed in the design data.

### AMC1 31TGB.33(b) Materials

*ED Decision 2013/011/R*

Approved specifications here are taken as being those produced by the applicant or those meeting internationally recognised standards as defined applicable in the type design data. Material specifications are those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities. In defining design properties, these material specification values are modified and/or extended as necessary by the constructor to take account of manufacturing practices (for example method of construction, forming, machining and subsequent heat treatment). Also the effects of environmental conditions, such as temperature and humidity expected in service, are taken into account.

### CS 31TGB.35 Fabrication methods

*ED Decision 2013/011/R*

The methods of fabrication used produces a consistently sound structure. If a fabrication process requires close control to reach this objective, the process is performed in accordance with an approved process specification.

### AMC1 31TGB.35 Fabrication methods

*ED Decision 2013/011/R*

Approved fabrication methods here are taken as being those produced by the applicant or those meeting internationally recognised standards as defined in the applicable type design data. Fabrication methods are those contained in documents accepted either specifically by the Agency or by having been prepared by an organisation or person which the Agency accepts has the necessary capabilities.

## CS 31TGB.36 Stress concentrations

*ED Decision 2013/011/R*

The structure is designed to avoid, as far as practicable, points of stress concentration and variable stresses that would cause fatigue to occur in normal operation.

## CS 31TGB.37 Fasteners

*ED Decision 2013/011/R*

- (a) Fasteners (e.g. bolts, pins, screws, karabiners) used in the structure conform to approved specifications.
- (b) Locking methods are established and documented.
- (c) Unless a joint is free from relative movement, secondary locking means are used.
- (d) Self-locking nuts are not used on bolts that are subject to rotation in service.

## AMC1 31TGB.37(a) Fasteners

*ED Decision 2013/011/R*

Approved specifications in the sense of these requirements are the standards described in the [AMC1 31TGB.33\(b\)](#).

## CS 31TGB.39 Protection of parts

*ED Decision 2013/011/R*

Parts, the failure of which could adversely affect safety, are suitably protected against deterioration or loss of strength in service due to weathering, corrosion, heat, abrasion, ground handling, ground transport, flight conditions or other causes.

## AMC1 31TGB.39 Protection of parts

*ED Decision 2013/011/R*

Suspension system cables and components manufactured from stainless steels (corrosion resistant steels) are considered compliant with this requirement.

To ensure the protection of parts, it is permissible to rely on recommended inspections (details in the Maintenance Manual).

In cases where deterioration or loss of strength is unavoidable during the life of the product, details of appropriate mandatory replacement lives or in-service testing are provided in the maintenance programme ([CS 31TGB.82](#)).

## CS 31TGB.41 Inspection provisions

*ED Decision 2013/011/R*

There are means to allow close examination of each part that requires repeated inspection and adjustment.

## CS 31TGB.43 Balloon system controls

*ED Decision 2013/011/R*

- (a) Each control can be operated easily, smoothly, and positively to allow proper performance of its functions. Controls are arranged and identified to prevent confusion or inadvertent operations.
- (b) Each control system and operating device is designed and installed in a manner that will prevent jamming, chafing, or unintended interference from passengers or loose items of equipment. The elements of the control system have design features or are distinctly and permanently marked to minimise the possibility of incorrect assembly that could result in failure of the control system.
- (c) Control cords
  - (1) General
    - (i) All control cords used for flight control are designed and installed to preclude entanglement and inadvertent operation.
    - (ii) The maximum force required for their operation does not exceed 340 N.
    - (iii) All control cords used for flight control are long enough to allow an increase of at least 10 % in the vertical dimension of the envelope.
    - (iv) Arming cords. If an arming device is employed to prevent inadvertent operation of an irreversible control, the part of the device to be handled by the operator is coloured with yellow and black bands.
  - (2) Venting cords
    - (i) If a venting cord is used to allow controlled release of the lifting gas and the vent can be resealed in flight, the part of the cord to be handled by the operator is coloured with red and white bands.
    - (ii) If a further cord is required to re-seal any vent, the part of the cord handled by the operator is coloured white.
  - (3) Rapid or emergency deflation cords.
    - (i) If a cord is used for rapid or emergency deflation of the envelope and the device cannot be resealed in flight, the part of the cord to be handled by the operator is coloured red.
    - (ii) In addition to subparagraph [CS 31TGB.43\(c\)\(1\)\(ii\)](#) the force required to operate the emergency deflation cord is not less than 110 N.

## CS 31TGB.45 Protection of envelope against tearing

*ED Decision 2013/011/R*

The design of the envelope is such that, while supporting limit load, local damage will not grow to an extent that results in an uncontrolled landing.

## AMC1 31TGB.45 Protection of envelope against tearing

*ED Decision 2013/011/R*

Demonstration of sufficient rip-stopping capability of the envelope material.

The objective of this demonstration is to show that the envelope material is sufficiently damage resistant. It therefore needs to be determined that the envelope material would not continue to tear under the maximum tension and conditions (temperature) experienced in normal operation.

In order to establish that the determined damage resistance is sufficient, the critical damage should be reviewed in relation to local damage foreseeable in normal operation.

The local damages to be considered are:

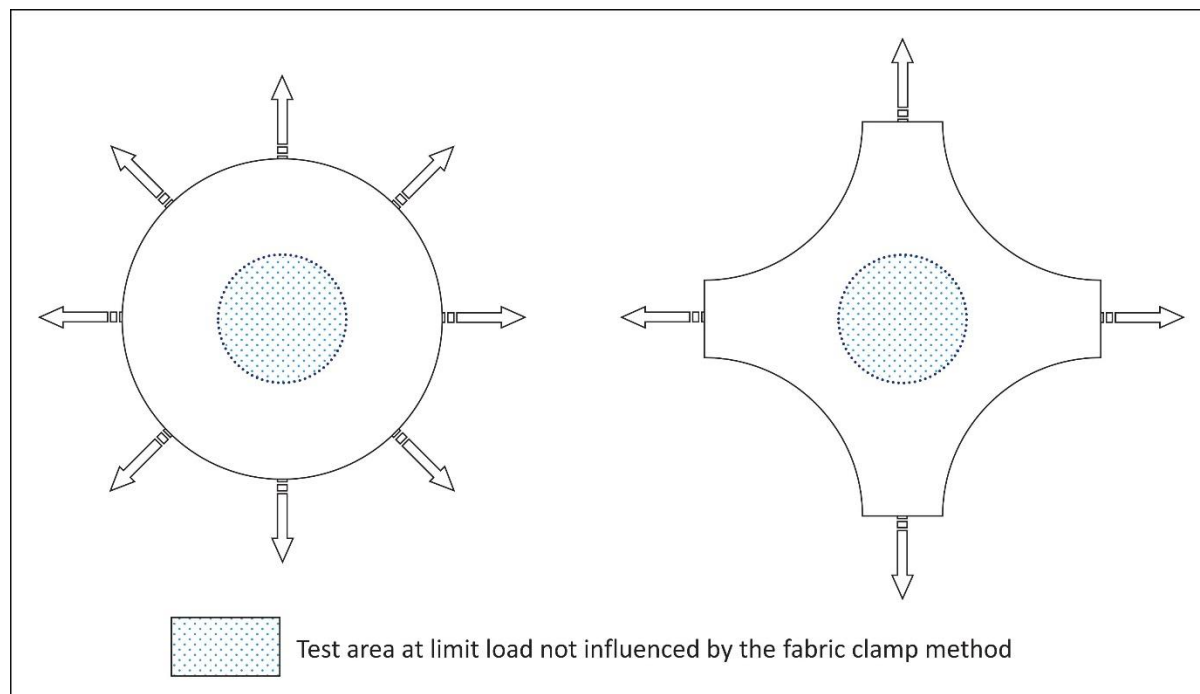
1. existing damage that may be undetected during pre-flight inspection, and
2. limited damage, inflicted during flight where the size of the damage in itself would not result in a catastrophic failure.

The resistance of envelope fabric to damage propagation is determined by test.

It is shown by test that a crosswise slit of at least 5 cm in the most unfavourable direction to the envelope fabric at the maximum tension experienced in service does not propagate. Test results from tests on similar fabric at the equal or higher tension and damage equal or larger than 5 cm are considered compliant.

A typical test set-up is provided below.

The tension in the test area of the specimen of the fabric should be equal to the maximum tension experienced in service and the test method should not create unacceptable tension re-distributions in the test area when the test is conducted.



If the balloon is equipped with a net to distribute and reduce the loads in the envelope, the net is regarded as a tear-prevention device.



## CS 31TGB.47 Precautions against loss of lifting gas

*ED Decision 2013/011/R*

The envelope is designed to exclude the possibility of loss of lifting gas likely to adversely affect safe operation taking into account dynamic pressure, temperature and fluctuations in air pressure over the permissible operating range.

## CS 31TGB.49 Limiting the operating pressure

*ED Decision 2013/011/R*

The balloon is equipped with an automatic and/or manual lifting gas release device. The response pressure of an automatic pressure release device is established. The quantity of gas to be released by the pressure release device is large enough to prevent a further increase in pressure. Opening of a pressure relief device is unambiguously indicated to the operator.

## AMC1 31TGB.49 Limiting of operating pressure

*ED Decision 2013/011/R*

The envelope pressure is limited to prevent the envelope from bursting. However, the definition of the envelope's maximum operating pressure depends on the design of the tethered gas balloon system. For inflated balloon systems the operating conditions are not limited to flight but also include the parking conditions if the balloon system stays inflated for a prolonged period between the flight operations. Thus, different cases need to be considered:

(a) Balloon systems staying inflated above maximum wind speed for flight operation

These balloon systems ensure envelope tautness by a ballonnet or other means of feeding/discharging gas into the envelope when moored on the ground in parking position to withstand the dynamic pressure of considerably high wind speeds. Here the maximum operating pressure is the maximum pressure established by the designer for high wind speeds whilst moored in parking condition to the ground. Under this condition the safety factors in [CS 31TGB.25](#) are applicable. The ascent factor in [CS 31TGB.23\(b\)](#) is however not applicable in the parking position. The response pressure of the automatic lifting gas release valve usually is higher than the maximum operating pressure to prevent the envelope from getting pumped out below dynamic pressure of the wind by unexpected gusts. A factor of not less than 1.4 times the maximum operating pressure during mooring has been shown by practical experience to be applicable.

(b) Balloon systems other than described in (a)

These balloon systems are usually smaller and ensure envelope tautness by means other than described under (a), i.e. by flexible parts in the envelope. They are designed for maximum wind speed during flight operation and will normally be deflated during high wind speed weather conditions. Here the maximum operating pressure is the pressure for flight operation established by the designer. The response pressure of the automatic lifting gas release device is not less than 1.15 times the maximum operating pressure.

For clarification, it should be noted that in a strict sense the automatic pressure release device can only prevent the further rise of pressure for the very moment. After release the device should close again in order to minimise the loss of lifting gas. If after a while the pressure increases again for any reason, the device will also open again. This behaviour is intended and does not impair safety.

## CS 31TGB.51 Rapid deflation means

ED Decision 2013/011/R

The envelope has a means allowing rapid deflation of the balloon.

## AMC1 31TGB.51 Rapid deflation means

ED Decision 2013/011/R

Rapid deflation means are used to deflate the envelope in cases like e.g. when:

1. wind speeds increase above the wind speed limitations for low mooring;
2. required during inflation before attachment of the tether cable; or
3. included in emergency procedures for unintended free flight.

Note: The rapid deflation means for low mooring acts automatically when the balloon is not being monitored by an operator.

## CS 31TGB.53 Tether system

ED Decision 2013/011/R

- (a) The suitability, durability, and reliability of the tether system is established for all phases of operating.
- (b) In operation and mooring the balloon is securely and reliably anchored to the ground.
- (c) Precautions are to be taken to mitigate the risks due to the effect of wind exceeding the maximum wind speed stated in the Flight Manual on the balloon when moored to the ground.

## AMC1 31TGB.53(a) Tether system

ED Decision 2013/011/R

The suitability, durability, and reliability of the tether system, including the tether control systems, is determined by a Failure Mode Effect Analyses (FMEA) covering all phases of operation.

For components of the tether system (i.e. the winch) compliance with the requirement of [CS 31TGB.53\(a\)](#) can be shown by a certificate from an expert body provided that:

- (a) this certificate specifies the conditions for safe operation of the winch that cover the conditions for safe operation of the balloon;
- (b) the winch system is capable of safely fulfilling the task of a tethered gas balloon winch;
- (c) compliance with the Machinery Directive 2006/42/EC (or equivalent (US) requirements) is the basis for the tethered gas balloon winch system;
- (d) modifications to the winch design do not invalidate the applicable requirements from the certificate that remain applicable after the modification.

Note: The overload protection of industrial winches is not applicable in the TGB application because overload cannot occur in a TGB application;

- (e) the expert body is an EC-notified organisation which has a certified structure and a proven capability and experience. 'Certified' means an approval by the government which requires an organisational structure and entails extended liability. 'Proven capability' means successfully managed projects that are reasonably comparable to the balloon winch case. Usually these are cranes, elevators, rides or similar winch technology;

- (f) the final report complies with the Annex II of the Machinery Directive 2006/42/EC (or equivalent (US) requirement); and
- (g) there is an alternative retrieve system which is able to cover a functional failure of the winch.

### AMC1 31TGB.53(c) Tether system

ED Decision 2013/011/R

An automatic rapid deflation (See [CS 31TGB.51](#)) of the balloon in case it breaks away from its low mooring position or any other system that will prevent uncontrolled free flight is an acceptable risk mitigation.

### CS 31TGB.59 Gondola

ED Decision 2013/011/R

- (a) The gondola may not rotate independently of the envelope unless safe operation is assured.
- (b) Projecting object in the gondola, that could cause injury to the occupants, are avoided or padded.
- (c) A holding grip is provided for each occupant.
- (d) Reasonable space is provided for all occupants, with regard to both comfort during the flight and to safety during the landing.
- (e) Occupants and items in the gondola are prevented from falling from the gondola.
- (f) The gondola occupant securing devices (e.g. doors or harnesses) comply with the following requirements:
  - (1) The device is closed and locked during flight.
  - (2) The device is protected against unintentional opening by persons or opening as the result of a mechanical failure during flight.
  - (2) The device can be opened by occupants and crew.
  - (3) Operation of the device shall be simple and obvious.
  - (4) The device has a visual indication that it is properly closed and locked.

### AMC1 31TGB.59 Gondola

ED Decision 2013/011/R

The requirements for a gondola carrying multiple free-standing persons is complied with when the applicable requirements for the 'carrier' provided in the Machinery Directive 2006/42/EC are met.

### AMC1 31TGB.59(c) Gondola

ED Decision 2013/011/R

A holding grip provides an obvious means for the occupants of the gondola to stabilise themselves during flight. The location or design of occupant securing devices (refer to [CS 31TGB.59\(f\)\(1\)](#)) is such that they do not invite occupants to use them as holding grip.

## AMC1 31TGB.59(d) Gondola

*ED Decision 2013/011/R*

For gondola providing standing space for the occupant, a minimum plan area of 0.3 m<sup>2</sup> is provided for each occupant.

## CS 31TGB.65 Night lighting

*ED Decision 2013/011/R*

- (a) If the balloon is operated at night, illumination of controls, equipment and essential information is provided for the safe operation of the balloon.
- (b) An Anti-Collision light system is installed which complies with the following:
  - (1) The Anti-Collision light consists of one or more flashing red (or flashing white) light(s) with an effective flash frequency of at least 40, but not more than 140, cycles per minute.
  - (2) The Anti-Collision light arrangement provides 360° horizontal coverage and at least 60° vertical coverage above and below the horizontal plane.
  - (3) The Anti-Collision light(s) are mounted on, or suspended from the balloon in order to identify the position of the envelope and gondola during night operation.
  - (4) At least one Anti-Collision light is visible from a distance between 100 m and 3 700 m (2 NM) at night under clear atmospheric conditions.
  - (5) The Anti-Collision light system can be switched on/off during flight.
- (c) The night lighting will not impair the crews' vision or performance during operation.

## AMC1 31TGB.65(a) Night lighting

*ED Decision 2013/011/R*

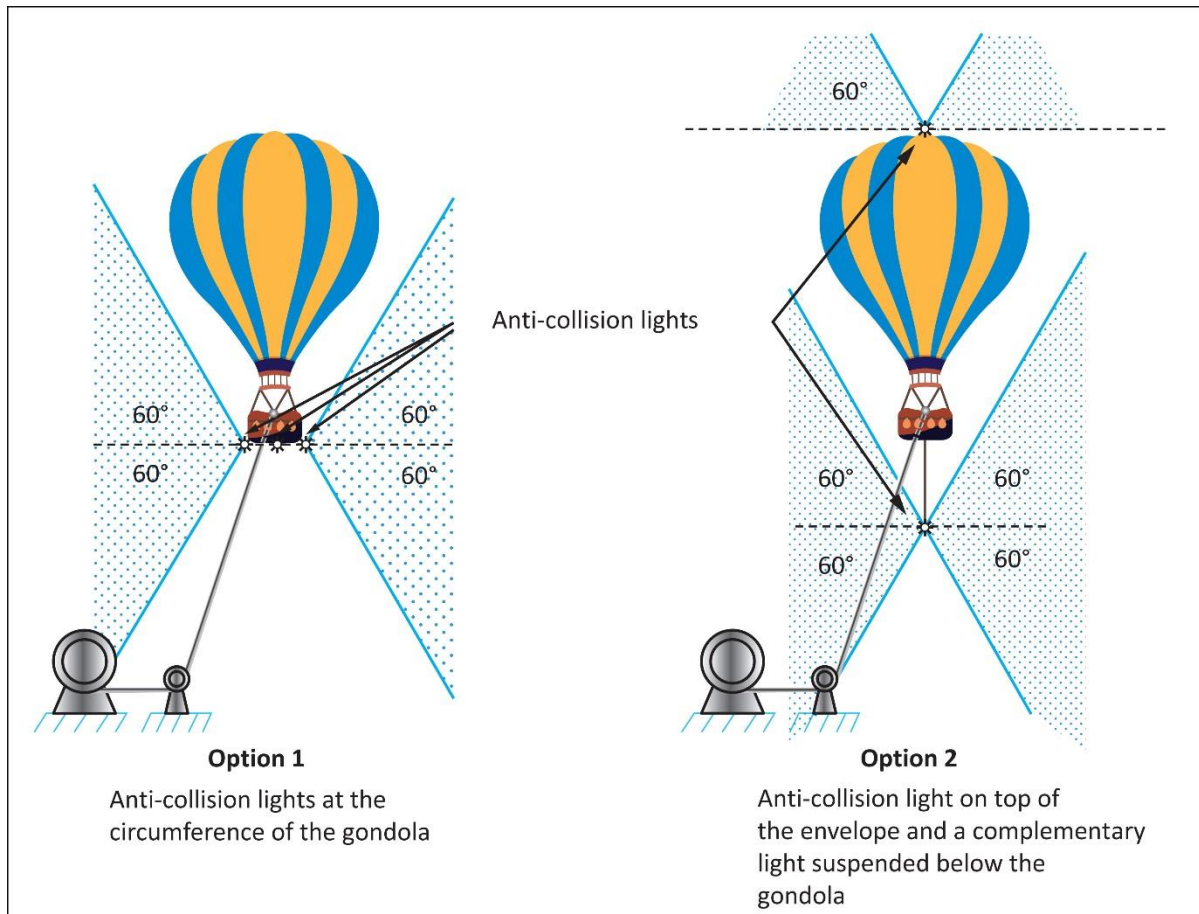
A means to provide illumination of the instruments, equipment and controls that are essential for the safe operation of the balloon may be instrument lighting, local lighting or any independent portable (non-handheld) light of sufficient capacity.

It is acceptable that lights can be switch on and off provided that the operator, without undue burden or ambiguity, can switch on the lighting in night conditions.

## AMC1 31TGB.65(b) Night lighting

ED Decision 2013/011/R

The following two schematics illustrations for anti-collision light arrangements show vertical coverage and positions that meet the requirements of [CS 31TGB.65\(b\)\(2\) and \(3\)](#).



The horizontal 360° coverage requirement is applicable to a distance between 100 m and 3 700 m (2 NM). It is acceptable that the light from the anti-collision lights is not visible from positions closer than 100 m horizontally from the balloon.

## AMC1 31TGB.65(c) Night lighting

ED Decision 2013/011/R

The light from the Anti-Collision light does not directly shine on the crew and passengers and does not create a reflection on the balloon or flare that disturbs the crews' performance.

Lighting level of controls, equipment and instruments are compatible with the crew night vision. This prevents untimely fatigue of the eyesight due to frequent adaptation when looking from bright light into dark night and vice versa.

## CS 31TGB.67 On-board power units

ED Decision 2013/011/R

If an on-board power unit is used to provide electrical power during operation, the system is designed and installed so as not to create a fire hazard or cause an electrical shock to the occupants.

## AMC1 31TGB.67 On-board power units

*ED Decision 2013/011/R*

For this AMC, it is assumed that only power units are used which conform to the state-of-the-art industrial standard. The safe operation of the balloon is not directly dependent on the proper function of the power unit. For all other designs, the Agency is consulted for more detailed requirements.

Power units of industrial standard used on-board of the balloon in addition comply with the following:

(a) General

The power unit is designed and installed so that under all normal operating conditions and reasonably foreseeable in service emergency situations, it does not endanger the aircraft, its occupants, or third parties.

(b) Ventilation

The occupants are accommodated in adequately ventilated areas where:

- (1) the carbon monoxide partial pressure does not exceed 1/20 000; and
- (2) fuel vapour is not present in harmful concentrations.

(c) Fire extinguishers

- (1) Unless the power unit has a fire extinguishing system by itself, there is at least one manual fire extinguisher within reach of an occupant.
- (2) The following applies to manual fire extinguishers. The type and quantity of the fire extinguishing substance is appropriate to the fire extinguisher's application area. Fire extinguishers:
  - (i) conform to EN3 or an equivalent specification acceptable to the Agency;
  - (ii) have a minimum capacity of 2 kg when using dry powder, unless the capacity is otherwise determined by the applicant; and
  - (iii) be at least of comparable effect when the extinguishing means is other than 'dry powder'.
- (3) Fire extinguishers in compartments intended for persons are designed to minimise the risk of toxicity caused by use of the fire extinguishing substance.

(d) Gondola

The following applies to the gondola when an on-board power unit is carried:

- (1) The material used is at least fire retardant.
- (2) Pipes, tanks or equipment that carries fuel, oil or flammable liquids are not to be placed in the gondola unless they are reasonably shielded, insulated, or otherwise protected so that fracture or failure of such parts causes no danger.

(e) Electrical earth connection

- (1) In order to prevent the occurrence of potential differences between components of the power unit and other electrically conductive parts of the balloon which cannot be ignored on account of their mass, such conductive parts are conductively interconnected.
- (2) The cross-sectional area of bonding connectors, if made from copper, is not less than 1.33 mm<sup>2</sup>.

(f) Fire protection for control system and structure

Control systems, suspension units or other structures in the power unit compartment which are added to the design by the applicant are made of fireproof material or shielded to withstand the effect of a fire.

(g) Fire protection

- (1) The power unit is adequately separated from the balloon's structure by fireproof bulkheads or ventilated bays.
- (2) Areas in which combustible liquids can accumulate as a result of a leaking tank have an adequate drain pipe. Collected leaking liquids cannot reach other locations in and under the craft which pose a potential risk of fire.
- (3) Precautionary measures are to be taken to reduce as far as possible the risk of fire as a result of a hard landing of the gondola.

(h) Power unit installation

- (1) Each power unit is supported so that the loads resulting from the weight of the unit are not concentrated.
- (2) There are pads, if necessary, to prevent chafing between each unit and its supports.
- (3) Materials employed for supporting the unit or padding the supporting members are non-absorbent or treated to prevent the absorption of fuel.
- (4) Each installation is ventilated and drained to prevent accumulation of flammable fluids and vapours.

(i) Fuel tank expansion space

- (1) Each external fuel tank added to the design by the applicant has an expansion space of sufficient capacity, but of not less than 2 % of the tank capacity, to prevent spillage of fuel onto the surfaces of the power unit and the balloon's structure due to thermal expansion or manoeuvre unless the design of the venting system precludes such spillage.
- (2) It is not possible to fill the expansion space inadvertently with the power unit in any normal ground attitude.

(j) Exhaust system, general

- (1) The exhaust system ensures safe disposal of exhaust gases without fire hazard or carbon monoxide contamination in any personnel compartment.
- (2) Each exhaust system part with a surface hot enough to ignite flammable fluids or vapours is located or shielded so that leakage from any system carrying flammable fluids or vapours will not result in a fire caused by impingement of the fluids or vapours on any part of the exhaust system, including shields for the exhaust system.
- (3) All parts of the exhaust system are located sufficiently far from or separated from adjacent parts of the balloon's structure by fireproof shielding.
- (4) No exhaust gases will discharge dangerously near any oil or fuel system drain.
- (5) Each exhaust system component added to the design by the applicant is ventilated to prevent points of excessively high temperature.



**(k) Firewalls**

- (1) The power unit is isolated from the rest of the balloons structure by a firewall, shroud, or equivalent means.
- (2) The firewall or shroud is constructed so that no hazardous quantity of liquid, gas or flame can pass from the power unit compartment to other parts of the balloon.
- (3) The firewall and shroud is fireproof and protected against corrosion or deterioration. The following materials are accepted as fireproof, when used in firewalls or shrouds, without being tested:
  - (i) stainless steel sheet, 0.38 mm thick;
  - (ii) mild steel sheet (coated with aluminium or otherwise protected against corrosion) 0.5 mm thick;
  - (iii) steel or copper base alloy firewall fittings.
- (4) Other materials such as fire protection paint and/or putty are only used if they conform to the FAA Advisory Circular No. 20-135 or equivalent accepted specifications.

**CS 31TGB.68 Master switch arrangement**

ED Decision 2013/011/R

- (a) There is a master switch arrangement to allow ready disconnection of electric power sources from the main bus.
- (b) The point of disconnection is adjacent to the sources controlled by the switch.
- (c) The master switch or its controls is installed so that the switch is easily discernible and accessible to the operator or occupant.

**CS 31TGB.69 Electric cables and equipment**

ED Decision 2013/011/R

- (a) Each electric connecting cable has adequate capacity and is correctly routed, attached and connected so as to minimise the probability of short circuits and fire hazards.
- (b) Overload protection is provided for each electrical equipment. No protective device protects more than one circuit essential to flight safety.
- (c) Unless each cable installation from the battery to a circuit protective device or master switch, whichever is closer to the battery, is of such power carrying capacity that no hazardous damage will occur in the event of a short circuit, this length of cable is protected or routed in relation to parts of the balloon's structure that the risk of short circuit is minimised.

**AMC1 31TGB.69(c) Electric cables and equipment**

ED Decision 2013/011/R

The risk of short circuit for the electrical cable between battery and master switch is minimised when the unprotected battery to master switch cables, of an adequate capacity, have a maximum length of 0.5 m.

In any event the capacities of protected cables are such that no hazardous damage will occur to the balloon and its occupants, nor its effects to the occupants from the generation of noxious fumes, due to electrical overloading of cables before a circuit protective device will operate.



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**(SUBPART E — NOT APPLICABLE)**

## SUBPART F — SYSTEMS AND EQUIPMENT

### CS 31TGB.71 Function and installation

ED Decision 2013/011/R

- (a) Equipment is:
  - (1) of a kind and design appropriate to its intended function;
  - (2) labelled as to its identification, function, or operating limitations, or any applicable combination of these factors; and
  - (3) installed according to limitations specified for that equipment.
- (b) Instruments and other equipment do not in themselves, or by their effect upon the balloon, constitute a hazard to safe operation.
- (c) The following instruments are installed if required to monitor the operating limitations:
  - (1) An envelope pressure gauge which displays the limits of permissible internal pressure. The operator is warned by an unambiguous signal if the limit of airborne operating pressure is exceeded.
  - (2) A temperature measuring device mounted at a point of the envelope that provides a measurement of the operational limitation.
  - (3) A wind velocity measuring device mounted at the most appropriate point of the envelope.
  - (4) A load cell at the most appropriate place in order to monitor the tensile force in the tether cable in service.
  - (5) Device(s) to provide the operational or design limitations information to the operator.
- (d) Systems and equipment that need to function properly for safe operation are identified in the operational instructions.

### AMC1 31TGB.71(c) Function and installation

ED Decision 2013/011/R

An instrument, in the classical sense, houses the sensor and the indicator (e.g. altimeter). However, it should be noted that for tethered gas balloons the sensor and the indicating display may be mounted far away from each other (e.g. sensor on the top; display in the gondola or at the winch). Hence, the word 'instrument' may not necessarily mean an integrated system.

The 'most appropriate place' for the instruments required by subparagraph [CS 31TGB.71\(c\)\(2\)](#) and [\(c\)\(3\)](#) shall be established in view of accuracy for measuring the values.

### AMC1 31TGB.71(d) Function and installation

ED Decision 2013/011/R

The correct functioning is not to be impaired by icing, heavy rain, high humidity, or low and high temperatures.

When ATC equipment is installed, it is shown that the electrical system is such that the operation of this equipment is not adversely affected.

The operating instructions provide information regarding systems and equipment essential for safe operation. Restrictions or mitigating actions for inoperative systems or equipment are included in the operating instructions to support continued safe operation if applicable.

## CS 31TGB.73 Instrument marking

ED Decision 2013/011/R

The following applies to all monitoring instruments:

- (a) If the cover glass of the instrument is marked and adequate measures are taken to ensure that the cover glass remains in its correct position relative to the graduated dial.
- (b) All markings are sufficiently wide and applied to ensure that they are easily and clearly readable by the operator.
- (c) The ranges for analogue indicators are identified as follows:
  - (1) Normal operating range – green;
  - (2) Caution area – amber or yellow; and
  - (3) Permissible maximum or minimum value - red radial line.
- (d) For digital indicators, the limits of use are displayed close to the indicator or a red signal is showing when the permissible limits are exceeded.

## CS 31TGB.75 Warning, caution, and advisory lights

ED Decision 2013/011/R

If warning, caution or advisory lights are installed, these are:

- (a) red, for warning lights (lights that indicate a condition that demands immediate corrective action);
- (b) amber or yellow, for caution lights (lights that indicate a condition that requires immediate awareness and the possible need for subsequent corrective action);
- (c) green, for safe operation lights; and
- (d) of any other colour, including white, for lights not described in paragraphs (a) through (c) of this paragraph, provided the colour differs sufficiently from the colours prescribed in paragraphs (a) through (c) to avoid possible confusion; and
- (e) visible under all likely lighting conditions.

## SUBPART G — OPERATING LIMITS AND DETAILS

### CS 31TGB.81 Flight manual

ED Decision 2013/011/R

- (a) Operating instructions are provided in a Flight Manual with each balloon.
- (b) The Flight Manual contains:
  - (1) a description of the balloon and its technical equipment with explanatory sketches;
  - (2) operating limitations, minimum required crew, normal procedures (including mooring, inflation, deflation and tethered flight), emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation. This section of the manual requires approval;
  - (3) specification of the permissible lifting gas;
  - (4) information for ground handling, transport and storage; and
  - (5) site preparation instructions and installation information required for safe operation.
- (c) The operating limitations, normal and emergency procedures, and other relevant information specific to the balloon's operating characteristics and necessary for safe operation are provided to the crew.

### AMC1 31TGB.81(b)(5) Flight Manual

ED Decision 2013/011/R

#### Site preparation and installation information

- (a) The site preparation instructions include:
  - (1) the magnitudes and x-, y- and z-directions of each load carrying interface between the tether system and the ground;
  - (2) dimensions and categories of safety areas on the ground and in the air;
  - (3) the ground condition and its permitted maximum mean slope; and
  - (4) any additional safety area required by the emergency descent procedure, if applicable.
- (b) The installation information includes:
  - (1) a list of the minimum installation crew and their necessary skills;
  - (2) a checklist of the necessary tools and devices for installing/de-installing; and
  - (3) a checklist describing the necessary sequential steps for installation/de-installation. The list highlights the safety critical phases including precautions and mitigating measures.

### CS 31TGB.82 Instructions for continued airworthiness

ED Decision 2013/011/R

A Maintenance Manual and a maintenance schedule against which the balloon must be inspected and maintained in a serviceable condition is provided with each balloon.

- (a) The instructions for Continued Airworthiness include information essential to the Continued Airworthiness of all parts and appliances of the balloon as required by CS-31TGB.

- (b) The instructions for Continued Airworthiness are in the form of a manual or manuals as appropriate for the quantity of data provided.
- (c) The format of the manual or manuals is provided in a practical arrangement.
- (d) The instructions for Continued Airworthiness cover:
  - (1) detailed description of the balloon and its components, systems and installations;
  - (2) handling instructions;
  - (3) basic control and operating information describing how the balloon's components, systems and installations operate;
  - (4) servicing information;
  - (5) a maintenance schedule against which the balloon is inspected and maintained;
  - (6) maintenance and inspection instructions;
  - (7) repair instructions;
  - (8) troubleshooting information; and
  - (9) airworthiness limitations that set forth each mandatory replacement time, inspection interval and related inspection procedure. This section of the manual requires approval.

### AMC1 31TGB.82 Instructions for continued airworthiness

ED Decision 2013/011/R

Note: The paragraph numbering of this AMC relates to the paragraph numbering of [CS 31TGB.82](#)

- (c) If instructions for continued airworthiness are not supplied by the manufacturer or designer of parts and appliances installed in the balloon, the instructions for continued airworthiness for the balloon need to include the information essential to the continued airworthiness of the balloon.

If manuals from different manufacturers are used, they need to provide a practical arrangement.

- (d)(1) The detailed description of the balloon and its components needs to include for each balloon:
  - (1) a description of the systems including the assembly and disassembly instructions;
  - (2) a parts list covering all construction and equipment components and the assemblies. Where applicable, individual parts need to be numbered so that they can be related to the different assemblies and that their number corresponds to the type plate of the assembly; and
  - (3) a summary of the materials and consumables used with procurement details.
- (d)(5) If applicable, the maintenance schedule may include instructions for continued airworthiness (e.g. recommended inspections or mandatory replacement of parts) to ensure the suitable protection of parts against deterioration or loss of strength, objective pass or fail criteria, e.g. applicable where tolerances need to be provided.
- (d)(6) The maintenance and inspection instructions need to provide information for removal and installation, cleaning, inspecting, adjusting, testing and lubrication of systems, parts and appliances of the balloon as required for continued airworthiness. Reference may be made to information from an accessory, instrument or equipment manufacturer as the source of this

information if it is shown that the item has an exceptionally high degree of complexity requiring specialised maintenance techniques, test equipment or expertise.

- (d)(9) If the instructions for continued airworthiness consist of multiple documents, the Airworthiness Limitations section needs to be included in the principal manual.

## CS 31TGB.83 Crew training and training information

ED Decision 2013/011/R

For a safe operation of the balloon, a training manual for crew is made available that contains as a minimum the following:

- (a) Operating instructions and information as required by [CS 31TGB.81](#);
- (b) Minimum crew qualifications;
- (c) Minimum training requirements, both theoretical and practical as appropriate;
- (d) A method to show proof of successfully completing the training; and
- (e) Recommended training requirements.

## AMC1 31TGB.83 Crew training and training information

ED Decision 2013/011/R

The crew training and training information contains the following aspects when applicable to the operation of the balloon:

- (a) general information on the training syllabus (theoretical and practical training) and examination;
- (b) description of the system in sufficient detail to understand the principles of the balloon and systems;
- (c) environmental conditions and their impact on safe operation;
- (d) procedures for:
  - (1) mooring (high and low);
  - (2) flying;
  - (3) inflation and deflation; and
  - (4) emergency procedures;
- (e) weather;
- (f) maintenance; and
- (g) record keeping.