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DRAFT STATUTORY INSTRUMENTS

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**2021 No.**

**The Space Industry Regulations 2021**

**PART 8**

**Safety of operator's spaceflight activities**

**CHAPTER 4**

**Other safety requirements**

*SECTION 1*

*Demonstrating requirements*

**Demonstration of compliance with safety requirements**

**83.**—(1) A spaceflight operator must demonstrate in the safety case and any revision of that safety case how the operator's spaceflight activities comply with the requirements in regulations 84 to 104 in so far as those requirements relate to the operator's spaceflight activities.

(2) If a launch vehicle has a human occupant, a spaceflight operator must demonstrate in the risk assessment, and any revision of that assessment, how the operator's spaceflight activities comply with the requirements in—

- (a) regulations 106 to 116 and 123, if the human occupant is a member of the crew or a remote pilot, in so far as those regulations relate to that member or remote pilot,
- (b) regulations 109, 110, 112, 113 and 117 to 123, if the human occupant is a spaceflight participant, in so far as those regulations relate to that participant, and
- (c) regulations 106 to 123, if the launch vehicle has both a member of the crew or a remote pilot and a spaceflight participant, in so far as each of these regulations relates to that member or pilot or that participant.

*SECTION 2*

*Requirements about a spaceflight operator's organisation and management*

**A spaceflight operator's organisation**

**84.**—(1) For the purposes of carrying out and supporting the operator's spaceflight activities, a spaceflight operator must have in place—

- (a) the financial and technical resources to carry out those spaceflight activities and do any other matter authorised by the launch operator licence or the return operator licence,
- (b) where the operator's spaceflight activities are authorised by a launch operator licence, a launch vehicle or a carrier aircraft and a launch vehicle,

- (c) sufficient operating staff and a management structure proportionate to the type of spaceflight activities which the spaceflight operator is carrying out,
- (d) facilities, infrastructure and equipment, and
- (e) an organisation which is capable of complying with these safety regulations and proactively seeks to improve the safety of the operator's spaceflight activities.

(2) In this regulation, "facilities, infrastructure and equipment" includes facilities, infrastructure or equipment relating to a mission management facility or ground control at the spaceport or other place, communications, retention of data and record keeping, transport, power, handling of hazardous material, analysis and testing, environmental protection, emergency response or security.

### **Safety management system**

**85.** A spaceflight operator must have in place a safety management system which complies with the requirements in Schedule 4.

## *SECTION 3*

### *Requirements about specific safety roles*

#### **Responsibilities of the safety manager**

**86.**—(1) Where an operator's spaceflight activities are authorised by a launch operator licence, the spaceflight operator must ensure that the safety manager—

- (a) reports directly to the accountable manager,
- (b) has a duty to inform that manager and the launch director of all safety concerns relating to the operator's spaceflight activities, including any such concerns reported to the safety manager by a member of the operating staff, before a launch and during any other part of those activities, and
- (c) is able to communicate directly with the launch director at all reasonable times.

(2) Where an operator's spaceflight activities are authorised by a return operator licence, the spaceflight operator must ensure that the safety manager—

- (a) reports directly to the accountable manager, and
- (b) has a duty to inform that manager of all safety concerns relating to the operator's spaceflight activities, including any such concerns reported to the safety manager by a member of the operating staff, before those activities commence and during any part of those activities.

(3) The safety manager must record in writing safety concerns referred to in paragraphs (1)(b) or (2)(b) and how those concerns are addressed.

#### **Responsibilities of the accountable manager**

**87.**—(1) A spaceflight operator must ensure that the accountable manager has a duty to address all safety concerns relating to the operator's spaceflight activities reported to that manager—

- (a) where the operator's spaceflight activities are authorised by a launch operator licence, before a launch and during any part of those activities, or
- (b) where the operator's spaceflight activities are authorised by a return operator licence, before those activities commence and during any part of those activities.

(2) The accountable manager must record in writing safety concerns referred to in paragraph (1) and how those concerns are addressed.

### **Responsibilities of the launch director**

- 88.** Where an operator’s spaceflight activities are authorised by a launch operator licence—
- (a) the spaceflight operator must ensure that the launch director—
    - (i) has a duty to check that all safety concerns relating to the operator’s spaceflight activities reported to that director have been addressed before a launch, and
    - (ii) is present at a mission management facility or ground control at the spaceport or other place during the operator’s spaceflight activities;
  - (b) the launch director must record in writing safety concerns referred to in paragraph (a)(i) and how those concerns are addressed.

### **Flight termination personnel**

- 89.** A spaceflight operator must—
- (a) if the launch vehicle has a flight safety system and that system is not autonomous, appoint flight termination personnel,
  - (b) ensure that such flight termination personnel are present at a mission management facility or ground control at the spaceport or other place during a flight,
  - (c) ensure that such flight termination personnel have the information which is necessary for such personnel to determine whether the flight safety system for which they are responsible is ready to be used,
  - (d) ensure that such flight termination personnel make a flight termination decision in the interests of the spaceflight operator’s safety duty and not for any other reasons, and
  - (e) authorise such flight termination personnel to make a flight termination decision without a requirement for approval from, or interference by, any other operating staff including, where the operator’s spaceflight activities are authorised by a launch operator licence, the launch director.

## *SECTION 4*

### *Safety operations manual*

#### **Safety operations manual**

**90.—**(1) A spaceflight operator must retain and keep up to date a safety operations manual which must contain the information, procedures and instructions necessary for the operating staff to carry out their spaceflight duties safely including, in particular, information, procedures and instructions relating to matters specified in Schedule 5.

- (2) When updating the safety operations manual, the spaceflight operator must—
  - (a) take into account the outcomes of the steps taken under regulation 28(1);
  - (b) consult the spaceport licensee, if any;
  - (c) consult the range control service provider, if any.
- (3) If the spaceflight operator updates the safety operations manual, the spaceflight operator must give the regulator the updated safety operations manual without delay.
- (4) The spaceflight operator must make available to its operating staff the safety operations manual, or those sections of the manual which are relevant to their spaceflight duties.
- (5) The spaceflight operator must ensure that each copy of the safety operations manual is kept up to date.

- (6) The spaceflight operator must take all reasonable steps to secure that all members of its operating staff—
- (a) are aware of the contents of every part of the safety operations manual which is relevant to their spaceflight duties, and
  - (b) undertake those duties in conformity with the relevant provisions of the safety operations manual.

## SECTION 5

### *Preparations for launch, return and other operations*

#### **The launch vehicle**

**91.**—(1) A spaceflight operator must not use a launch vehicle in the operator’s spaceflight activities unless it is fit for those activities.

- (2) A launch vehicle is fit for the operator’s spaceflight activities if that vehicle—
- (a) complies with the conditions in paragraph (3), and
  - (b) complies with any conditions about that vehicle in the launch operator licence or the return operator licence.
- (3) The conditions are that the launch vehicle—
- (a) has been designed to a specification that meets the technical requirements of the vehicle,
  - (b) has been built consistently with that specification,
  - (c) has been through the verification and validation processes set out in regulation 94 which demonstrate that it—
    - (i) conforms with the technical requirements referred to in sub-paragraph (a),
    - (ii) is free from workmanship errors which could prevent the vehicle carrying out the operator’s spaceflight activities safely,
    - (iii) is otherwise ready to take part in those activities, and
    - (iv) is capable of carrying out those activities safely, and
  - (d) if it has a human occupant, the systems and flight recorder referred to in regulation 109 have been installed in the vehicle.

#### **The launch vehicle’s ground support equipment**

**92.**—(1) A spaceflight operator must not use a launch vehicle’s ground support equipment unless such equipment is fit for supporting the operator’s spaceflight activities.

- (2) A launch vehicle’s ground support equipment is fit for supporting the operator’s spaceflight activities if that equipment—
- (a) complies with the conditions in paragraph (3), and
  - (b) complies with any conditions about that equipment in the launch operator licence or the return operator licence.
- (3) The conditions are that the ground support equipment—
- (a) has been designed to a specification that meets the technical requirements of the launch vehicle,
  - (b) has been built consistently with that specification, and

- (c) has been through the verification and validation processes set out in regulation 94 which demonstrate that it—
  - (i) conforms with the condition in sub-paragraph (a),
  - (ii) is free from workmanship errors which could prevent the equipment supporting the launch vehicle and the operator’s spaceflight activities being carried out safely,
  - (iii) is otherwise ready to support the launch vehicle and those activities, and
  - (iv) is capable of supporting those activities being carried out safely.

### **A reusable launch vehicle**

**93.**—(1) Before the launch of a launch vehicle which has been used in one or more flights, a spaceflight operator must, by carrying out maintenance, servicing and repair and, if necessary, renewing any part of that vehicle, ensure that—

- (a) the vehicle conforms with the technical requirements of the launch vehicle and is fit for the operator’s spaceflight activities in accordance with regulation 91, or
- (b) is returned to a condition which conforms with those requirements and which is fit for those activities.

(2) Before the launch of a launch vehicle which has been used in one or more flights, the member of the operating staff responsible for ensuring that the work in paragraph (1) is done must prepare a written report—

- (a) providing details of the work which has been done in accordance with paragraph (1), and
- (b) confirming that—
  - (i) the vehicle conforms with the technical requirements referred to in paragraph (1)(a) or has been returned to a condition which conforms with those requirements, and
  - (ii) the vehicle otherwise complies with regulation 91 and is fit for the operator’s spaceflight activities.

(3) Copies of the report referred to in paragraph (2) must be sent by the person referred to in that paragraph to the spaceflight operator and to any member of the operating staff who has duties which are relevant to the work which has been done to the launch vehicle in accordance with paragraph (1).

(4) This regulation applies to any part of a launch vehicle which is capable of being launched and has been used in one or more flights as it applies to the whole of a launch vehicle which has been used in one or more flights.

### **Verification and validation by testing etc. of the launch vehicle and the ground support equipment**

**94.**—(1) For the purposes set out in paragraph (2), before a launch, a spaceflight operator must carry out verification and validation processes—

- (a) by testing, analysing, reviewing or inspecting the launch vehicle and the ground support equipment, and
- (b) by integrated testing of that vehicle and equipment.

(2) The purposes are to ensure that—

- (a) the launch vehicle is fit for the operator’s spaceflight activities, and
- (b) the ground support equipment is fit for supporting that launch vehicle and the operator’s spaceflight activities.

(3) The spaceflight operator must—

- (a) record the results of the verification and validation referred to in paragraph (1) in writing, and
  - (b) before a launch, ensure that copies of the results of such verification and validation are received and considered by the spaceflight operator and any member of the operating staff who has duties which are relevant to the results of the verification and validation.
- (4) In this regulation—
- “integrated testing” includes testing how the launch vehicle and its ground support equipment and any systems of that vehicle and that equipment function together;
  - “systems” includes hardware and software.

### **The spaceport (or other place of launch or landing) and the range**

**95.**—(1) A spaceflight operator must ensure that the spaceport or other place used for the operator’s spaceflight activities is fit for those activities.

(2) A spaceflight operator must ensure that the range for the operator’s spaceflight activities is fit for those activities.

### **Communication during the operator’s spaceflight activities**

**96.**—(1) During an operator’s spaceflight activities, the spaceflight operator must, where necessary, ensure that there is a reliable means of communication for sharing information between the mission management facility or ground control at the spaceport or other place and—

- (a) the range control service provider,
- (b) any site or other place used in connection with range control services,
- (c) the spaceport licensee,
- (d) relevant meteorological service providers,
- (e) relevant air navigation service providers, and
- (f) relevant emergency services.

(2) During an operator’s spaceflight activities, the spaceflight operator must, where necessary, provide a reliable means of communication for sharing information between the launch vehicle, carrier aircraft and any other aircraft taking part in the operator’s spaceflight activities and the mission management facility or ground control at the spaceport or other place.

### **Monitoring the environmental and meteorological conditions**

**97.**—(1) A spaceflight operator must monitor environmental and meteorological conditions during the operator’s spaceflight activities in so far as necessary to carry out those activities safely.

(2) The spaceflight operator must make the latest environmental and meteorological information referred to in paragraph (1) available without delay to—

- (a) the accountable manager, the safety manager and, where the operator’s spaceflight activities are authorised by a launch operator licence, the launch director and any other members of the operating staff who require such information to carry out their spaceflight duties safely, and
- (b) the range control service provider, the spaceport licensee and any other person who requires such information to support the operator’s spaceflight activities being carried out safely.

## **Dangerous goods**

**98.**—(1) A spaceflight operator must only load dangerous goods onto a launch vehicle or permit a vehicle to carry such goods if—

- (a) the terms of the launch operator licence or return operator licence permit the spaceflight operator to do so, and
- (b) the spaceflight operator complies with those terms.

(2) For the avoidance of doubt any reference to loading dangerous goods onto a launch vehicle or carrying them on such a vehicle includes placing, suspending or carriage of such goods beneath a launch vehicle.

## *SECTION 6*

### *Launch, return and other operations*

## **Conditions for commencing the operator’s spaceflight activities**

**99.**—(1) Before an operator’s spaceflight activities commence, the spaceflight operator or, where the operator’s spaceflight activities are authorised by a launch operator licence, the launch director, must be satisfied that the activities can be carried out safely and the conditions in paragraph (2) have been met.

(2) The conditions are that—

- (a) a launch vehicle is fit for the operator’s spaceflight activities;
- (b) the spaceport, or other place, from which the launch or landing is to take place is fit for the operator’s spaceflight activities and the spaceport licensee, if launch or landing is to take place from a spaceport, confirms that, in so far as that licensee’s responsibilities are concerned, these activities can be carried out safely;
- (c) the range is fit for the operator’s spaceflight activities and the range control service provider confirms that, in so far as the responsibilities of that provider are concerned, these activities can be carried out safely;
- (d) a rehearsal of the mission referred to in regulation 70(5) was conducted and the spaceflight operator was satisfied that the operator’s spaceflight activities could be carried out safely;
- (e) the relevant emergency services have confirmed that they are on stand-by;
- (f) where the launch vehicle has a flight safety system—
  - (i) a member of the flight termination personnel, if that system is not autonomous, or
  - (ii) a member of the operating staff responsible for such an autonomous system, confirms that the flight safety system is ready to be used;
- (g) where the operator’s spaceflight activities are authorised by a launch operator licence, the launch of the launch vehicle can take place at a time when the launch vehicle will not collide with any known space object during its flight or when it first reaches a stable orbit;
- (h) where the operator’s spaceflight activities are authorised by a launch operator licence, the launch director and any flight termination personnel are present at the mission management facility or ground control at the spaceport or other place;
- (i) such other operating staff as are necessary to carry out the operator’s spaceflight activities safely are present at the mission management facility or ground control at the spaceport or other place;
- (j) the security manager has confirmed that the requirements of the operator security programme have been met;

- (k) the prevailing meteorological and environmental conditions are suited to the spaceflight operator carrying out the operator's spaceflight activities safely;
- (l) any relevant safety operational procedures relating to the launch authorised by a launch operator licence or the return to earth authorised by a return operator licence in the safety operations manual have been followed.

#### **During flight: monitoring and termination**

**100.**—(1) If necessary to ensure that the operator's spaceflight activities are carried out safely, a spaceflight operator must monitor in real time—

- (a) the flight of a launch vehicle, authorised by a launch operator licence, until it reaches a stable orbit or completes sub-orbital activities, or
- (b) the flight of a launch vehicle, authorised by a launch operator licence or a return operator licence, on its return to land in the United Kingdom.

(2) Where the launch vehicle has a flight safety system which is not an automated system, flight termination personnel must make a flight termination decision during the flight of that vehicle—

- (a) if at any time that vehicle malfunctions and that malfunction prevents the operator's spaceflight activities being carried out safely,
- (b) if at any time a system—
  - (i) used to monitor whether or not the launch vehicle remains fit for the operator's spaceflight activities, or
  - (ii) used to detect a malfunction,
 fails and that failure threatens the carrying out of the operator's spaceflight activities safely, or
- (c) if it is necessary for any other reason which threatens or prevents the carrying out of the operator's spaceflight activities safely.

(3) In this regulation "system" includes hardware and software.

#### **Additional requirement relating to the launch vehicle during operator's spaceflight activities**

**101.**—(1) If necessary to ensure that an operator's spaceflight activities are carried out safely or to secure compliance with the international obligations of the United Kingdom, the spaceflight operator must after a launch vehicle has reached a stable orbit—

- (a) monitor the trajectory of that vehicle in so far as it is possible to do so,
- (b) monitor the basic orbital parameters of that vehicle including nodal period, inclination, apogee and perigee,
- (c) take reasonable steps to—
  - (i) avoid the launch vehicle interfering with the space activities of other persons in the peaceful exploration and use of outer space,
  - (ii) limit or prevent major accident hazards to the health, safety and property of persons arising from the launch vehicle in orbit, and
  - (iii) prevent contamination of outer space arising from the launch vehicle in orbit or adverse changes in the environment of the earth from that vehicle in orbit, and
- (d) take any other action necessary to carry out the operator's spaceflight activities safely.

(2) If the spaceflight operator is disposing of the launch vehicle by causing it to re-enter through the earth's atmosphere, that operator must carry out those activities in a way which ensures they are carried out safely.



- (3) In this regulation the reference to taking reasonable steps in paragraph (1)(c) may include—
- (a) avoiding the release of space debris;
  - (b) avoiding a collision between the launch vehicle and its payload after the release or separation of that payload from the vehicle;
  - (c) manoeuvring the vehicle;
  - (d) deactivating a component part of that vehicle;
  - (e) passivating that vehicle by dissipating the hazardous materials carried on board or preventing their accumulation.

## SECTION 7

### *Recording and retaining information for safety purposes*

#### **Information on human occupants and dangerous goods on board a launch vehicle**

- 102.**—(1) Before launch, a spaceflight operator must prepare—
- (a) a list of the names and addresses of all human occupants on board the launch vehicle and of individuals on board any carrier aircraft, and
  - (b) a list of all dangerous goods on board the launch vehicle and any carrier aircraft.
- (2) The spaceflight operator must retain the lists referred to in paragraph (1) for a period of three years beginning with the day of the launch of the launch vehicle carrying the human occupants or dangerous goods on those lists.

#### **Recording, collecting and retaining information made before or during the operator's spaceflight activities**

- 103.**—(1) For the purposes referred to in paragraph (3), a spaceflight operator must record—
- (a) information shared through the means of communication referred to in regulation 96,
  - (b) where the launch vehicle has a flight recorder required by regulation 109(3), data relating to conditions and events on board the launch vehicle during the operator's spaceflight activities onto that recorder,
  - (c) data in connection with the launch vehicle which is obtained using telemetry during the operator's spaceflight activities and which relates to the tracking of that vehicle during those activities, and
  - (d) any other data collected or used during the operator's spaceflight activities.
- (2) For the purposes referred to in paragraph (3), the spaceflight operator must collect and retain—
- (a) the information referred to in paragraph (1),
  - (b) records of correspondence between the spaceflight operator and the regulator before launch and during the operator's spaceflight activities,
  - (c) the current safety case and current risk assessment and any written document describing any revisions to the safety case or the risk assessment,
  - (d) any written record of safety concerns referred to in regulations 86(3), 87(2) and 88(b) or an occurrence,
  - (e) the meteorological and environmental information referred to in regulation 97(2),
  - (f) reports of maintenance work carried out on communication and recording systems used to make the records referred to in paragraph (1) and of checks made to such systems to ensure the launch vehicle is fit for the operator's spaceflight activities, and

- (g) any other information about the operator's spaceflight activities which is relevant to such activities being carried out safely.
- (3) The purposes of recording, collecting and retaining the information referred to in paragraphs (1) and (2) are—
- (a) to maintain and improve the spaceflight operator's safety performance,
  - (b) to enable the regulator to perform its duties referred to in section 26(1),
  - (c) to enable the spaceflight operator to comply with the requirement to make an occurrence report under Part 16, and
  - (d) to enable the spaceflight operator to comply with any demands for such information from an investigator-in-charge of SAIA in accordance with regulation 23 of the Spaceflight Activities (Investigation of Spaceflight Accidents) Regulations 2021.
- (4) The spaceflight operator must retain the information referred to in paragraphs (1) and (2) for a period beginning with the date on which the launch operator licence or the return operator licence is granted and ending three years after the date on which that licence expires, unless that information has been recorded by that vehicle's flight recorder and the launch vehicle has not been involved in a spaceflight accident arising from or in the course of the operator's spaceflight activities.
- (5) Where no spaceflight accident arose from or in the course of the operator's spaceflight activities, information recorded by the launch vehicle's flight recorder must only be retained until the completion of those activities.

## SECTION 8

### *Emergency response*

#### **Emergency response plan requirement**

- 104.**—(1) A spaceflight operator must have in place and maintain an emergency response plan for the operator's spaceflight activities.
- (2) An emergency response plan under paragraph (1) must—
- (a) detail how the spaceflight operator will respond in an emergency;
  - (b) be appropriate for the operator's spaceflight activities;
  - (c) provide for the notification of the relevant emergency services and coordination with any relevant local authority and such services in response to an emergency during the operator's spaceflight activities;
  - (d) provide for prevention of harm to individuals after the emergency has occurred;
  - (e) provide for coordination of the spaceflight operator's emergency response plan with—
    - (i) the emergency response plan prepared by the spaceport licensee, and
    - (ii) any emergency response plans of other organisations with which the spaceflight operator must interact during the operator's spaceflight activities.
- (3) The spaceflight operator must, at suitable intervals not exceeding three years—
- (a) test the emergency response plan in so far as practicable, and
  - (b) review and, where necessary, revise the plan.
- (4) The spaceflight operator must supply to the regulator—
- (a) the results of any test of the emergency response plan conducted under paragraph (3)(a), and

- (b) before or immediately after they come into effect, details of the revisions, if any, it has made to the emergency response plan as a result of a review conducted under paragraph (3) (b).
- (5) For the purposes of this regulation “relevant local authority” means—
  - (a) in relation to a launch operator licence, a local authority in whose administrative area the spaceport or other place from which the launch vehicle or carrier aircraft is to be launched or is launched is situated, or
  - (b) in relation to a return operator licence, a local authority in whose administrative area—
    - (i) is situated a spaceport or other place at which a planned or controlled landing or a planned but uncontrolled landing of a launch vehicle is to take place or takes place, or
    - (ii) an unplanned landing of a launch vehicle in the United Kingdom is likely to take place.