
DRAFT STATUTORY INSTRUMENTS

2021 No.

The Space Industry Regulations 2021

PART 8

Safety of operator's spaceflight activities

CHAPTER 1

Interpretation

Interpretation

78.—(1) In this Part—

“current safety case” means—

- (a) if the safety case has not been revised and accepted by the regulator in accordance with regulations 80 and 81, the safety case, or
- (b) if the safety case has been revised and accepted by the regulator in accordance with regulations 80 and 81, that revised safety case;

“fit for the operator's spaceflight activities”—

- (a) in the case of a launch vehicle has the meaning given in regulation 91(2);
- (b) in the case of a range means that—
 - (i) the range is suitable for carrying out those activities safely, and
 - (ii) the Secretary of State is providing range control services for those activities or another person providing those services is authorised to do so by a range control licence;
- (c) in the case of a spaceport means that—
 - (i) the spaceport is suitable for carrying out those activities safely, and
 - (ii) the operation of the spaceport is authorised by a spaceport licence which permits the carrying out of the operator's spaceflight activities at that spaceport;
- (d) in the case of a place other than a spaceport from which the launch or landing is to take place or takes place means that place is suitable for carrying out those activities safely;

“fit for supporting the operator's spaceflight activities” in relation to a launch vehicle's ground support equipment, has the meaning given in regulation 92(2);

“flight” means—

- (a) in regulations 89, 99 and 100 and paragraph 19 of Schedule 5, any period from the moment when the launch vehicle first moves for the purpose of launching until the completion of the operator's spaceflight activities but does not include any period when that vehicle has reached a stable orbit;
- (b) in other regulations, any period from the moment when the launch vehicle first moves for the purpose of launching until the completion of the operator's spaceflight activities;

“flight recorder” means any device for recording data relating to the flight of the launch vehicle, whether or not the device is located on the launch vehicle;

“operating staff” means an employee or agent of a spaceflight operator;

“range control service provider” means the Secretary of State or a person who holds a range control licence and provides range control services to a spaceflight operator;

“relevant air navigation service providers” means air navigation service providers which are relevant to the operator’s spaceflight activities;

“relevant emergency services” means emergency services which are likely to be required to respond to an emergency at the location of the operator’s spaceflight activities;

“relevant meteorological service providers” means meteorological service providers which are relevant to the operator’s spaceflight activities;

“risk assessment” is to be construed in accordance with regulation 32;

“safety case” is to be construed in accordance with regulation 29;

“safety-critical information” has the meaning given in paragraph 1 of Schedule 4;

“safety operations manual” is to be construed in accordance with regulation 90(1);

“spaceflight duties” means duties in connection with the operator’s spaceflight activities;

“spaceflight operator’s safety duty” means the requirement in regulation 79(1).

(2) In this Part “carrying out the operator’s spaceflight activities safely” or “to carry out the operator’s spaceflight activities safely” has the meaning given in regulation 79(2).

(3) Any reference in this Part to the operator’s spaceflight activities being “carried out safely” is to be read in accordance with regulation 79(2).

CHAPTER 2

A spaceflight operator’s safety duty

A spaceflight operator’s safety duty

79.—(1) A spaceflight operator must secure that the operator’s spaceflight activities are carried out safely.

(2) A spaceflight operator carries out the operator’s spaceflight activities safely by carrying them out—

- (a) in accordance with the current safety case by—
 - (i) preventing a major accident from occurring, and
 - (ii) mitigating the consequences of such an accident if it does occur, and
- (b) in accordance with the current risk assessment, by securing the safety of a human occupant, if the launch vehicle has such an occupant.

CHAPTER 3

Review and revision of safety case and risk assessment

Safety case and risk assessment review and revision requirements

80.—(1) A spaceflight operator must review and, where necessary, revise the current safety case and, if the launch vehicle has a human occupant, the current risk assessment—

- (a) before the spaceflight operator introduces an operational change which is likely to materially alter the instructions and procedures in the safety operations manual;

- (b) before the spaceflight operator makes—
 - (i) any modifications to the launch vehicle or carrier aircraft, or
 - (ii) changes to the operator’s spaceflight activities, any flight safety system or to the duties of the flight termination personnel,where such modifications or changes are likely to materially affect the spaceflight operator carrying out the operator’s spaceflight activities safely;
 - (c) following any of the events or matters referred to in paragraph (2).
- (2) The events and matters are—
- (a) there has been an occurrence arising out of, or in the course of, the operator’s spaceflight activities or another significant failing in those activities;
 - (b) the spaceflight operator has become aware of an occurrence elsewhere that may affect the carrying out of the operator’s spaceflight activities safely;
 - (c) the spaceflight operator has become aware of new facts or technological knowledge about safety, including knowledge arising from analysis of accidents or occurrences, which may affect the carrying out of the operator’s spaceflight activities safely;
 - (d) the application of the spaceflight operator’s safety management system has given rise to a concern that the operator’s spaceflight activities may result in a major accident hazard which may affect the carrying out of those activities safely;
 - (e) the launch operator licence or the return operator licence has been transferred or varied in accordance with section 15;
 - (f) a change in any matter relating to either the spaceport or other place from which the launch or landing is to take place or takes place or the range used for the operator’s spaceflight activities which increases the level of risk of those activities;
 - (g) the regulator directs the spaceflight operator to review and, where necessary, revise the current safety case or if the launch vehicle has a human occupant, the current risk assessment in addition to that safety case.
- (3) In carrying out a review of a current safety case or a current risk assessment, a spaceflight operator must take into account the spaceflight operator’s safety duty.

Steps required after review, or review and revision, of the safety case

- 81.**—(1) Where the current safety case has been reviewed under regulation 80 and revised, the spaceflight operator must supply to the regulator without delay a copy of—
- (a) the current safety case which has been revised under regulation 80, and
 - (b) the results in writing of any tests and any technical analysis or other information supporting the need for the revision of that safety case.
- (2) Where the current safety case has been reviewed under regulation 80 and a decision has been taken not to revise it, the spaceflight operator must without delay—
- (a) inform the regulator in writing, and
 - (b) provide the regulator with written reasons for that decision.
- (3) Until the spaceflight operator has received the regulator’s confirmation in writing that it accepts the revised safety case supplied to it under paragraph (1), the spaceflight operator must not—
- (a) implement any changes to its spaceflight activities as a result of the revision of that safety case, or
 - (b) commence a launch of a launch vehicle or a carrier aircraft.

Steps required after review, or review and revision, of the risk assessment

82.—(1) This regulation applies in addition to regulation 81 if the launch vehicle has a human occupant.

(2) Where the current risk assessment has been reviewed under regulation 80 and revised, the spaceflight operator must supply to the regulator without delay a copy of—

- (a) the current risk assessment which has been revised under regulation 80, and
- (b) the results in writing of any tests and any technical analysis or other information supporting the need for the revision of that risk assessment.

(3) Where the current risk assessment has been reviewed under regulation 80 and a decision has been taken not to revise it, the spaceflight operator must without delay—

- (a) inform the regulator in writing, and
- (b) provide the regulator with written reasons for that decision.

(4) Until the spaceflight operator has received the regulator’s confirmation in writing that it accepts the revised risk assessment supplied to it under paragraph (2), the spaceflight operator must not—

- (a) implement any changes to its spaceflight activities as a result of the revision of that risk assessment, or
- (b) commence a launch of a launch vehicle.

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.

CHAPTER 5

Additional safety requirements for launch vehicles with human occupants

SECTION 1

Interpretation

Interpretation

105.—(1) In this Chapter any reference to a pilot in command, a pilot or a remote pilot “carrying out the flight safely” or to the flight being “carried out safely” has the meaning referred to in paragraph (2).

- (2) A pilot in command, pilot or a remote pilot carries out the flight safely by carrying it out—
- (a) in accordance with the current safety case by—
 - (i) preventing a major accident from occurring, or
 - (ii) mitigating the consequences of such an accident if it does occur, and

- (b) in accordance with the current risk assessment, by securing the safety of a human occupant.

SECTION 2

The crew or remote pilots

The roles and duties of each member of the crew or a remote pilot

106.—(1) If the launch vehicle has a crew, before the operator’s spaceflight activities commence a spaceflight operator must—

- (a) define the respective roles and duties of every member of the crew,
- (b) ensure that every member of the crew is aware of their role and their duties, and
- (c) provide copies of checklists of the duties to every member of the crew.

(2) If the launch vehicle has a remote pilot, before the operator’s spaceflight activities commence a spaceflight operator must—

- (a) define the role and duties of the remote pilot,
- (b) ensure that the remote pilot is aware of their role and their duties, and
- (c) provide copies of checklists of the duties to the remote pilot.

Information about the flight

107.—(1) If the launch vehicle has a flight crew, a spaceflight operator must make available to each member of that crew all information necessary for the flight crew to carry out the flight safely.

(2) If the launch vehicle has a remote pilot, a spaceflight operator must make available to that pilot all information necessary for the remote pilot to carry out the flight safely.

Authority to pilot in command or remote pilot

108. If the launch vehicle has a pilot in command or a remote pilot, a spaceflight operator must give that pilot the authority to give the commands, make the decisions or take the actions referred to in regulation 115.

SECTION 3

The launch vehicle

Additional conditions if the launch vehicle has a human occupant

109.—(1) The systems referred to in regulation 91(3)(d) are that, if the launch vehicle has a human occupant, that vehicle must have—

- (a) a system capable of providing on board power and atmospheric conditions for the inhabited areas of the launch vehicle which are adequate to sustain life and consciousness of a human occupant or equipment to provide such conditions to each human occupant,
- (b) an adequate redundant system for supplying oxygen to a human occupant and preventing depressurisation, or the harmful effects of depressurisation, in inhabited areas of the launch vehicle,
- (c) a system capable of warning the pilot in command or the remote pilot of any significant accumulation of ice on the exterior of the launch vehicle,

- (d) a system which enables the spaceflight operator or any crew to detect smoke in the inhabited areas of the launch vehicle and to assist in preventing or suppressing a fire in that area,
 - (e) a system capable of displaying any information necessary to any flight crew to ensure that the flight is carried out safely, and
 - (f) a system capable of restraining any member of the crew or any spaceflight participant in their seat when necessary to ensure that the flight is carried out safely.
- (2) Any system referred to in paragraph (1) includes any hardware or software relating to that system and must—
- (a) be suited to the operator’s spaceflight activities, and
 - (b) be capable of functioning during those activities.
- (3) If a launch vehicle has a human occupant, that vehicle must have a flight recorder.
- (4) In this regulation “a redundant system” means a system which provides the essential services of a primary system in the event of the failure of such a primary system.

Numbers of crew or spaceflight participants on board

110. Before an operator’s spaceflight activities commence, the spaceflight operator must determine the number of flight crew, cabin crew, spaceflight participants or both crew and spaceflight participants to be carried on board the launch vehicle, taking into account—

- (a) any conditions of the launch operator licence or return operator licence describing matters to be taken into account when determining these numbers,
- (b) the limits of the launch vehicle during operations as established by the technical requirements of that vehicle,
- (c) the configuration of the launch vehicle and loading,
- (d) the duration of the mission,
- (e) any medical needs of a human occupant,
- (f) the equipment including seating available to a human occupant, and
- (g) any other matter which may affect the carrying out of the operator’s spaceflight activities safely, in so far as these numbers are concerned.

Accessibility of instruments and equipment

111. If the launch vehicle has a flight crew, a spaceflight operator must ensure that instruments, systems and equipment within the launch vehicle are readily operable and accessible from the station where—

- (a) any pilot in command who needs to use them is seated, and
- (b) another member of the flight crew who needs to use them is seated.

Emergency equipment

112.—(1) A spaceflight operator must ensure that the launch vehicle is equipped with emergency equipment and a means of emergency evacuation of any human occupants in so far as is reasonable for and suited to the operator’s spaceflight activities.

(2) The spaceflight operator must ensure that—

- (a) each human occupant is aware of the location of the emergency equipment within the launch vehicle and the means of emergency evacuation from that vehicle,

- (b) immediately before the flight, each human occupant is provided with information about how to use the emergency equipment and means of emergency evacuation and that such information is available on board the launch vehicle, and
- (c) the emergency equipment and means of emergency evacuation are identifiable and accessible on the launch vehicle for immediate use.

(3) In this regulation “emergency equipment” means first aid supplies, fire extinguishers, radio beacons, clothing and other emergency and survival equipment relevant to the operator’s spaceflight activities.

Atmospheric conditions on board

113.—(1) A spaceflight operator must maintain adequate atmospheric conditions in the inhabited areas of the launch vehicle, or provide equipment to provide such conditions to each human occupant, by monitoring and controlling—

- (a) the composition of the atmosphere including oxygen, carbon dioxide and the need for revitalisation of the internal atmosphere,
- (b) pressure, temperature and humidity,
- (c) contaminants that include particles and any harmful or hazardous concentrations of gases or vapours, and
- (d) ventilation and circulation.

(2) In this regulation “revitalisation” means a process by which the internal atmosphere of the inhabited parts of the launch vehicle is sustained at a healthy level, by introducing oxygen to replace the oxygen which has been consumed and by removing carbon dioxide.

SECTION 4

Specific obligations of pilot in command, flight crew or remote pilot

Obligations of pilot in command or remote pilot immediately before the flight

114. Immediately before a flight, the pilot in command or the remote pilot must—

- (a) perform an inspection of the launch vehicle and its systems and equipment to the extent that it is practicable to do so, and
- (b) consult any of the spaceflight operator’s written records relating to the fitness, condition and preparation of the launch vehicle, in so far as necessary to ensure the flight is carried out safely.

Obligations of pilot in command or remote pilot to carry out flight safely

115.—(1) If a launch vehicle has a pilot in command or a remote pilot, that pilot must give commands, make appropriate decisions and take appropriate actions during the flight of that vehicle which are necessary to ensure that the flight is carried out safely.

(2) A pilot in command or a remote pilot must inform the spaceflight operator and the regulator at the earliest practicable opportunity if any of the commands, decisions or actions referred to in paragraph (1) did not comply with provisions contained in or made under the Act and the conditions of the launch operator licence or return operator licence.

Pilot in command, flight crew or remote pilot to remain at stations

116.—(1) If a launch vehicle has a flight crew, that crew must during the flight remain at their stations secured in their seat by a safety belt or other restraint device unless there is more than one member of the flight crew and the pilot in command permits a member to leave the member's station temporarily—

- (a) to provide urgent assistance to another human occupant, or
- (b) for an urgent physiological or operational need.

(2) If a launch vehicle has a pilot in command that pilot may during the flight only leave the pilot in command's station temporarily where—

- (a) there is more than one member of the flight crew,
- (b) the flight can be carried out safely by another member of the flight crew, and
- (c) there is an urgent physiological reason or operational need to do so.

(3) If a launch vehicle has a remote pilot that remote pilot may during the flight only leave the remote pilot's station temporarily where—

- (a) there is more than one remote pilot,
- (b) the flight can be carried out safely by that other pilot, and
- (c) there is an urgent physiological reason or operational need to do so.

Pilot in command's obligations to a spaceflight participant about stations

117. If a launch vehicle has a pilot in command, that pilot must ensure that each spaceflight participant is seated at the spaceflight participant's assigned station and secured in that participant's seat by a safety belt or other restraint device—

- (a) before launch and landing and during any taxiing operation necessary for the operator's spaceflight activities,
- (b) during periods of flight when the effects on the human body of the forces due to acceleration and their duration are most acute, and
- (c) at any other time when necessary for the flight to be carried out safely.

Remote pilot's obligations to a spaceflight participant about stations

118. If a launch vehicle has a remote pilot, that pilot must ensure that each spaceflight participant is seated at the spaceflight participant's assigned station and secured in that participant's seat by a safety belt or other restraint device—

- (a) before launch and landing and during any taxiing operation necessary for the operator's spaceflight activities,
- (b) during periods of flight when the effects on the human body of the forces due to acceleration and their duration are most acute, or
- (c) at any other time when necessary for the flight to be carried out safely.

Launch director's or safety manager's obligations to a spaceflight participant about stations

119.—(1) If a launch vehicle has no pilot in command or remote pilot—

- (a) where the operator's spaceflight activities are authorised by a launch operator licence, the launch director, or
- (b) where those activities are authorised by a return operator licence, the safety manager,

must ensure that each spaceflight participant is seated at the spaceflight participant's assigned station and secured in that participant's seat by a safety belt or other restraint device at the times or during the periods referred to in paragraph (2).

- (2) The times or periods are—
- (a) before launch and landing and during any taxiing operation necessary for the operator's spaceflight activities,
 - (b) during periods of flight when the effects on the human body of the forces due to acceleration and their duration are most acute, and
 - (c) at any other time when necessary for the flight to be carried out safely.

SECTION 5

Spaceflight participants

Prohibiting the launch vehicle carrying a spaceflight participant

120. A spaceflight operator must not carry a spaceflight participant in a launch vehicle unless that vehicle is fit for the operator's spaceflight activities in accordance with regulation 91.

A spaceflight participant to remain at station

121.—(1) A spaceflight participant must remain seated at the spaceflight participant's assigned station and secured in that participant's seat by a safety belt or other restraint device at all times and during all the periods referred to in regulations 117 to 119 unless one of the individuals in paragraph (2) permits such a participant to leave that station.

- (2) The individuals are—
- (a) the pilot in command,
 - (b) a member of the flight crew,
 - (c) a remote pilot,
 - (d) the launch director, where the operator's spaceflight activities are authorised by a launch operator licence, or
 - (e) the safety manager, where the operator's spaceflight activities are authorised by a return operator licence.

Availability of seating requirement to a spaceflight participant

122. A spaceflight operator must make a copy of the requirement relating to seating in regulation 121 available to each spaceflight participant.

SECTION 6

Human occupant: information to be given after consent form is signed

Information about the operator's spaceflight activities

123. Before an operator's spaceflight activities commence, the spaceflight operator must give each human occupant the information referred to in regulations 209 and 210 which has become available since that occupant signed the consent form referred to in section 17.

CHAPTER 6

Offences and penalties

Failure of launch director to check conditions met before operator's spaceflight activities commence

124. A launch director who fails, without reasonable excuse, to comply with the obligation to check that the conditions in regulation 99(2) are met before an operator's spaceflight activities commence, commits an offence.

Failure of flight termination personnel to follow obligation to make a flight termination decision

125. A member of the flight termination personnel who fails, without reasonable excuse, to comply with the obligation to make a flight termination decision in regulation 100(2), commits an offence.

Failure of a pilot in command or remote pilot to carry out obligations before the flight

126. A pilot in command, or a remote pilot, who fails to comply with the obligations in regulation 114(a) or (b) before the flight, commits an offence.

Failure of pilot in command or remote pilot to carry out flight safely

127. A pilot in command, or a remote pilot, who fails to comply with the obligations in regulation 115(1), commits an offence.

Failure of a pilot in command, flight crew or a remote pilot to remain at stations

128.—(1) A member of the flight crew who fails to comply with the requirement in regulation 116(1) to remain at that member's station secured in their seat by a safety belt or other restraint device unless there is more than one member of the flight crew and the pilot in command permits the member to leave that station for the reasons referred to in regulation 116(1)(a) or (b), commits an offence.

(2) A pilot in command who leaves the pilot in command's station for reasons other than those referred to in regulation 116(2)(a) to (c), commits an offence.

(3) A remote pilot who leaves the remote pilot's station for reasons other than those referred to in regulation 116(3)(a) to (c), commits an offence.

Failure of a pilot in command to carry out obligations to a spaceflight participant about stations

129. A pilot in command who fails, without reasonable excuse, to comply with the requirement in regulation 117 to ensure that a spaceflight participant is seated at the spaceflight participant's assigned station and secured in that spaceflight participant's seat by a safety belt or other restraint device at the times or during the periods referred to in regulation 117(a) to (c), commits an offence.

Failure of a remote pilot to carry out obligations to a spaceflight participant about stations

130. A remote pilot who fails, without reasonable excuse, to comply with the requirement in regulation 118 to ensure that a spaceflight participant is seated at the spaceflight participant's assigned station and secured in that spaceflight participant's seat by a safety belt or other restraint device at the times or during the periods referred to in regulation 118(a) to (c), commits an offence.

Failure of a launch director or a safety manager to carry out obligations to a spaceflight participant about stations

131.—(1) A launch director referred to in regulation 119(1)(a), who fails, without reasonable excuse, to comply with the requirement in regulation 119 to ensure that a spaceflight participant is seated at the spaceflight participant’s assigned station and secured in that spaceflight participant’s seat by a safety belt or other restraint device at the times or during the periods referred to in regulation 119(2)(a) to (c), commits an offence.

(2) A safety manager referred to in regulation 119(1)(b), who fails, without reasonable excuse, to comply with the requirement in regulation 119 to ensure that a spaceflight participant is seated at the spaceflight participant’s assigned station and secured in that spaceflight participant’s seat by a safety belt or other restraint device at the times or during the periods referred to in regulation 119(2)(a) to (c), commits an offence.

Failure of a spaceflight participant to remain at station

132. A spaceflight participant who fails, without reasonable excuse, to comply with the requirement in regulation 121(1) to remain seated at the spaceflight participant’s assigned station and secured in that participant’s seat by a safety belt or other restraint device at all times or during all the periods referred to in regulations 117 to 119 unless one of the individuals listed in regulation 121(2) permits that participant to leave that station, commits an offence.

Penalties

133. A person who is guilty of an offence under any of regulations 124 to 132 is liable—

- (a) on summary conviction in England and Wales, to a fine;
- (b) on summary conviction in Scotland or Northern Ireland, to a fine not exceeding the statutory maximum;
- (c) on conviction on indictment, to imprisonment for a term not exceeding two years, or a fine, or both.