
STATUTORY INSTRUMENTS

2021 No. 792

The Space Industry Regulations 2021

PART 9

Cosmic radiation requirements: crew of a launch vehicle and crew of a carrier aircraft

CHAPTER 2

Generally applicable provisions

Authorisation and prohibition on exposure

135.—(1) No spaceflight operator may employ or otherwise engage an individual to perform duties as a crew member on a launch vehicle or carrier aircraft that would render the individual liable to receive an effective dose of cosmic radiation that exceeds 6 mSv in a calendar year unless the individual is a classified crew member (see regulation 142).

(2) No spaceflight operator may employ or otherwise engage an individual to perform duties as a classified crew member on a launch vehicle or carrier aircraft that would render the individual liable to receive an effective dose of cosmic radiation that exceeds 20 mSv in a calendar year (see regulation 142).

Risk of exposure of crew members to cosmic radiation

136.—(1) Subject to paragraph (2), a spaceflight operator must ensure that a suitable and sufficient assessment of the magnitude of the risk to crew members from exposure to cosmic radiation in the course of performing their duties on board a launch vehicle or a carrier aircraft (an “exposure assessment”) is conducted before carrying out the operator’s spaceflight activities.

(2) Where a spaceflight operator has completed an exposure assessment (the “previous exposure assessment”) in relation to the operator’s spaceflight activities involving the launch vehicle or carrier aircraft, no further exposure assessment needs to be conducted in relation to those activities, but a further assessment must be conducted if—

- (a) the spaceflight operator has reason to suspect that the previous exposure assessment is no longer valid,
- (b) there has been a material change to the matters to which the previous exposure assessment relates, or
- (c) the spaceflight operator has reasonable cause to believe that a crew member has received an overexposure while performing duties for the spaceflight operator on board the launch vehicle or the carrier aircraft.

(3) The spaceflight operator must take into account the results of the most recent exposure assessments it has conducted in relation to the operator’s spaceflight activities when managing the operation of the launch vehicle or carrier aircraft, with a view to minimising as far as reasonably possible the exposure of crew members to cosmic radiation.

(4) In carrying out an exposure assessment the spaceflight operator must take into account any existing legal requirements relating to safety.

Requirements to assess and inform

137.—(1) A spaceflight operator must—

- (a) take appropriate measures to assess the exposure to cosmic radiation of each crew member,
- (b) take into account the assessed exposure when organising working schedules, with a view to reducing the doses of highly exposed crew, and
- (c) inform each crew member of their dose as assessed under sub-paragraph (a).

(2) “Assess” and “highly exposed” have the same meaning as in Article 35 of the Directive.

Protection of pregnant crew

138.—(1) A spaceflight operator must inform all crew members of the importance of giving early notification of pregnancy to the spaceflight operator in view of the risks of exposure to the unborn child.

(2) If the suspension of a pregnant crew member’s medical certificate is lifted in accordance with regulation 76(5)(a), a spaceflight operator must ensure that—

- (a) the conditions of exposure to cosmic radiation for the crew member in the context of her duties are such that the equivalent dose to the unborn child is as low as reasonably achievable, and
- (b) it is unlikely that that dose will exceed 1 mSv during the remainder of the pregnancy.

(3) In this regulation, “equivalent dose” has the meaning given in Article 4(33) of the Directive.

Monitoring of exposure to cosmic radiation: crew other than classified crew

139.—(1) A spaceflight operator must ensure that the exposure to cosmic radiation of crew members who are not classified crew members is monitored to such an extent as is sufficient to identify any crew members who should be classified under regulation 143.

(2) Monitoring of the crew of a carrier aircraft or a launch vehicle under this regulation may be undertaken by proper use of any of the following computer programs, which calculate the effective dose of cosmic radiation received by an individual on board a carrier aircraft or a launch vehicle, or of a computer program that performs an equivalent function—

- (a) CARI-7;
- (b) EPCARD;
- (c) SIEVERT PN;
- (d) PCAire.

(3) In this regulation—

- (a) “CARI-7” means the computer programme of the same name, developed by the Federal Aviation Administration’s Civil Aerospace Medical Institute;
- (b) “EPCARD” means the European Program Package for the Calculation of Aviation Route Doses, developed by the Institute of Radiation Protection at Helmholtz Zentrum Munich, German Research Centre for Environmental Health;
- (c) “SIEVERT PN” means the computer programme of the same name, developed by the Institut De Radioprotection et de Surete Nucleaire;
- (d) “PCAire” means the computer programme of the same name, developed by PCAire Inc.

Provision of information and training to crew

140.—(1) A spaceflight operator must ensure that each crew member is given appropriate information and training about—

- (a) the health risks arising from exposure to cosmic radiation while performing the crew member’s duties on board the carrier aircraft or the launch vehicle,
- (b) the spaceflight operator’s procedures for conducting an exposure assessment mentioned in regulation 136(1), and
- (c) the spaceflight operator’s procedures for assessing and monitoring crew exposure to cosmic radiation.

(2) The spaceflight operator must ensure that training under paragraph (1) is given before the crew member performs any duties on board the carrier aircraft or launch vehicle.

Overexposure

141.—(1) Where a spaceflight operator has reasonable cause to believe that a crew member has received an overexposure while performing duties for that operator on board a launch vehicle or a carrier aircraft, the spaceflight operator must immediately conduct an investigation in order to conclude beyond reasonable doubt that no overexposure has occurred (a “negative conclusion”).

(2) If the spaceflight operator is not able to reach a negative conclusion within fourteen days beginning with the date on which the investigation commenced (the “fourteen day period”), an overexposure is deemed to have occurred and the spaceflight operator must—

- (a) immediately—
 - (i) notify the regulator of the overexposure,
 - (ii) where the crew member is a classified crew member, notify the approved doctor who undertook the crew member’s most recent medical examination or health review of the overexposure, and
 - (iii) take appropriate steps to notify the crew member affected of the overexposure,
- (b) where requested by the crew member, immediately arrange for an approved doctor to undertake a medical examination of the crew member in relation to the overexposure, and
- (c) as soon as is reasonably practicable after the fourteen day period, conduct such investigation as is necessary to determine—
 - (i) the dose of cosmic radiation received by the crew member, so far as is reasonably practicable, and
 - (ii) the necessary measures, if any, to be taken to prevent a recurrence of the overexposure.

(3) Where an investigation is conducted under paragraph (2)(c), the spaceflight operator must immediately upon the conclusion of the investigation—

- (a) notify the regulator, and
- (b) take appropriate steps to notify the crew member affected,

of the results of the investigation and any determination as to the necessary measures to be taken to prevent a recurrence of the overexposure.

(4) A spaceflight operator who determines that there are measures necessary to be taken to prevent a recurrence of the overexposure must implement those measures as soon as practicable after such a determination is reached.

(5) A spaceflight operator who conducts an investigation pursuant to paragraph (1) must ensure that a report of the investigation is retained until the second anniversary of the date on which the investigation was commenced.

(6) A spaceflight operator who conducts an investigation pursuant to paragraph (2)(c) must ensure that a report of the investigation is retained until the later of—

- (a) the 75th anniversary of the birth of the crew member affected, whether or not the crew member survives until that date, and
- (b) the 30th anniversary of the date on which the investigation was commenced.

Continued working of overexposed crew

142.—(1) No spaceflight operator may employ or engage a crew member who has received an overexposure to perform duties on board a launch vehicle or a carrier aircraft that would render the crew member liable to receive an effective dose of cosmic radiation that exceeds X mSv for the remainder of the calendar year.

(2) In paragraph (1), “X” is the lower of—

- (a) the dose limit applicable to the crew member divided by 365 and multiplied by the number of days in the remainder of the calendar year, and
- (b) the dose limit applicable to the crew member minus the effective dose of radiation received by the crew member for the calendar year to the date on which the crew member received the overexposure, excluding the dose resulting in the overexposure.

(3) A spaceflight operator employing or engaging a crew member who has received an overexposure to perform duties on board a launch vehicle or a carrier aircraft must inform the crew member of the dose limit applicable to the crew member.

(4) Where an overexposure received by a crew member was caused by exceptional circumstances beyond the control of the spaceflight operator, the dose resulting in the overexposure is not to be included in any assessment of the crew member’s effective dose for the purposes of regulation [135](#).

(5) In this regulation—

- (a) the “dose limit applicable to the crew member” is —
 - (i) for classified crew members, 20 mSv;
 - (ii) for all other crew members, 6 mSv;
- (b) the “remainder of the calendar year” begins with the day after the date on which the crew member received the overexposure and ends with the last day of the calendar year.