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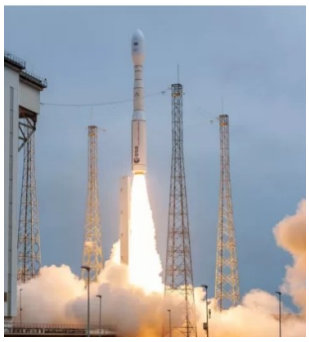
ORDER REGULATING THE OPERATION OF THE FACILITIES OF THE GUIANA SPACE CENTRE



Lionel Suchet

President Director-General of the Centre national d'études spatiales (French national centre for space studies) – CNES

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PREAMBLE

President of the Centre national d'études spatiales (CNES),

Having regard to:

- The Agreement between the European Space Agency and the Government of the French Republic on the Guiana Space Centre and associated services (2023–2035 period), or its subsequent versions, hereinafter referred to as the 'CSG Agreement', signed on 22 March 2023, and in particular Article 4.2 thereof, which states that the Centre national d'études spatiales ('CNES') is responsible for the CSG Master plan;

- Law No 2008-518 of 3 June 2008, as amended, on space operations (hereinafter the 'Law on space operations');

- Articles L331-1 to L331-8 and R331-1 to R331-27 of the Research Code, relating to CNES, and in particular Article L331-6(I) and (II) thereof, which task the President of the Centre national d'études spatiales with a general mission of Safeguarding and a mission of coordinating security measures;

- Decree No 65-388 of 21 May 1965 and its amendment by Decree of 25 July 1967 declaring the public utility and urgency of the execution by the Centre national d'études spatiales of works to establish a satellite launch base in the department of French Guiana and the corresponding acquisitions of land for the construction of that base;

- Decree No 89-314 of 16 May 1989, as amended, on the coordination of security measures during space launch operations in French Guiana;

- The Decree of 22 January 2001 establishing the extent of the zones and the easements applicable in the vicinity of the Kourou (French Guiana) radio electric centre No 9730510314 for the protection of radio electric reception against electromagnetic disturbances;

- Decree No 2009-643 of 9 June 2009, as amended, concerning authorisations granted pursuant to Law No 2008-518 of 3 June 2008 on space operations;

- the Order of 2 June 2006 establishing the list of vitally important sectors of activity and designating the coordinating ministers for those sectors;

- The Order of 5 December 2008 creating a no-fly zone identified as SO P3 in French Guiana;

- The Order of 31 March 2011, as amended, on the technical Regulation pursuant to Decree No 2009-643 of 9 June 2009 concerning authorisations granted pursuant to Law No 2008-518 of 3 June 2008 on space operations (hereinafter the 'Technical Regulation');

- the Order of 10 June 2021 establishing the list of areas forbidden to aerial photography using photographic, cinematographic or any other remote sensing equipment;

- the Order of 2 January 2023 establishing the list of areas in which it is prohibited to capture and process data collected from aircraft;

- The deed of transfer of the State to CNES, dated 10 October 1971, relating to the territory of the communes of Cayenne, Kourou, Macouria and Sinnamary;

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PART I. GENERAL PROVISIONS

CHAPTER I.1 INTRODUCTORY PROVISIONS

ARTICLE 1 – DEFINITIONS

Risk activity: activity involving a hazardous product or products or Risk system(s), or taking place in a Hazard zone.

Risk activities are classified in two categories according to how the state of the system changes as they progress:

- Risk activity in dynamic phase: Risk activity in which at least one Risk element in the system tolerates a voluntary or sustained change of state (including mechanical, electrical, pneumatic or chemical);

- Risk activity in static phase: A risk activity in which no Risk element in the system tolerates a change of state.

Authorised agents: all authorised persons, under the conditions laid down in Article R331-18 of the Research Code, responsible for carrying out the checks necessary to carry out the tasks provided for in Article L331-6 of the Research Code.

Allocation: the level of probability assigned to the occurrence of a feared or specified event when developing safety objectives;

Confined atmosphere: an atmosphere in which air renewal may be insufficient for a person to stay safely within it.

Explosive atmosphere: an atmosphere liable to become explosive due to specific local conditions.

Toxic-risk atmosphere: an atmosphere liable to contain substances that are toxic to humans.

Safety barrier: a function or product, hardware, software or human intervention that prevents the occurrence or course of an event detrimental to safety.

This may notably be:

- a physical property;
- an intrinsic characteristic of the product, hardware or software;
- a technological device.

Exceptionally, and in a duly justified manner, this barrier may consist of a procedure. The effectiveness of a Safety Barrier is assessed in terms of its reliability.

Passive safety barrier: A Safety barrier that functions without human intervention or stored energy, in order to provide advance protection against a potential Malfunction.

Guiana Space Centre (CSG): a technical, industrial and operational complex, the perimeter of which is defined by order of the Minister responsible for space, bringing together Establishments, undertakings, bodies with various statuses and all of the resources needed to prepare and perform launches. These activities relate in particular to the design, preparation, production, storage and transport of space Objects and their constituent elements, as well as to tests and operations carried out within or beyond this scope.

Payload: object (satellite, probe, etc.) intended to be embarked on a launcher with a view to its launch in extra-atmospheric space.

CNES/Guiana Space Centre (CNES/CSG): Establishment of the Centre national d'études spatiales located within the perimeter of the CSG. It comprises all Facilities and staff under the direct responsibility or authority of the Director of the CSG Establishment.

Predictive intervention criteria: criteria for Neutralisation of the Launch vehicle before the end of the Safeguard and Intervention mission as specified in Article 69, aimed at anticipating Risks subsequent to this end of the Safeguard and Intervention Mission.

Safety factor: the ratio between the permissible limit of a parameter characterising a system or element and its maximum expected value under Nominal operation. Its value incorporates the concept of dispersion specific to each domain concerned.

Burst safety factor (Jr): the ratio between the allowable rupture limit of a parameter characterising a system or element and its maximum expected value under Nominal operation. For any part of a pressurised fluid system, this is the ratio between the permissible burst pressure (the permissible burst pressure is the calculated relative burst pressure, validated during the qualification tests) and the maximum expected operating pressure (hereinafter 'MEOP').

Instantaneous safety factor (Js): the ratio between the permissible burst pressure and the relative pressure reached at the time considered by the system in question.

Stamping coefficient (Jt): the ratio between the stamping pressure and the maximum pressure reached in the presence of staff for a given fluid system.

Security contact: an entity, within each Establishment located within the perimeter of the CSG, that enforces the security measures in its Establishment and is the priority contact of the Authorised agents. This entity is independent of those in charge of production or operations within the same Establishment.

Flight corridor: volume in which the Launch vehicle is likely to fly, taking into account normal drifting.

Declarant: any organisation, operator, Developer, Main contractor or agent of the above who intends to build a new facility, modify an existing facility or build a Ground resource within the perimeter of the CSG.

Free-flight domain: a domain beyond the Flight corridor in which the Launch vehicle follows a trajectory compatible with safety risk control requirements during the MSI. Before leaving this domain, the Launch vehicle is neutralised.

Risk element: part of a system which, in the event of a failure, external event or human error, could give rise to a feared event with catastrophic or serious consequences.

Launch set (EL): all Facilities necessary for commissioning and controlling a type of launcher with a view to its launch or the return of a stage onto the site.

Safeguard entity: an entity within each Establishment located within the CSG perimeter that ensures that the Safeguard measures are respected within its Establishment and which is the main contact for the authorised Agents. This entity is independent of those in charge of production or operations within the same Establishment.

Stamping test: test of pressurising a system to a specified pressure known as the stamping pressure.

Human error: omitted or incorrect human action during the production or implementation phase.

Establishment: all Facilities for production and operating activities, under the responsibility of the same operator and generally located on the same site, including their equipment and related activities when at least one of the Facilities is subject to legislation relating to facilities classified for environmental protection and pyrotechnic safety. This definition is without prejudice to the classification given by other legislation (notably the Labour Code, the Tax Code, the Defence Code, the Environmental Code or the Commercial Code).

Operational safety study: a study that identifies all the technical and functional Risks, demonstrates achievement of the desired safety objectives, allows the prioritisation of Risks to be taken into account from the design stage and offers checking of the correct application of risk control measures.

External Event: event whose origin is distinct from the Launch vehicle, such as atmospheric conditions (e.g. wind and lightning) and the conditions of communication, navigation and surveillance services. This term does not include malicious acts.

Fail Operational (FO): fit for mission after a Failure.

Fail Safe (FS): safe after a Failure. Maintaining safety after two independent Failures is defined as FS/FS.

Technical fact: any event, voluntary or otherwise, affecting hardware or software, that is liable to result in a foreseeable deviation from the original definition (modification), including in terms of performance, or an unforeseeable deviation (anomaly).

Phlegmatisation: reducing the sensitivity of a material or pyrotechnic device to a given type of external aggression.

On-board function: in the sense of the Safeguard, any on-board element effecting changes to the physical and kinematic state of the launch or re-entry vehicle. This is to be distinguished from the commonly accepted meaning of the functional analysis of a system in relation to its specifications, which includes all the system's sub-functions.

Independence: Two devices, elements, functions, information, systems, etc., are said to be independent if they have no common failure Mode and if they do not generate any reciprocal action between them.

Payload manufacturer: a company contracted directly or indirectly to the launch operator, responsible for preparing and implementing a payload within the CSG perimeter, with a view to its launch.

Facility: all infrastructure contributing to an activity necessary for the preparation or execution of a space operation.

Coordination Instruction (CI): a measure taken by the President of the Centre national d'études spatiales in the context of their power to coordinate the security measures provided for in Articles R331-14 to R331-17 of the Research Code.

Regulatory Instruction (RI): a regulatory act adopted by the President of the Centre national d'études spatiales or their delegate pursuant to a specific provision of this Order.

Interception: interruption of the continuity of the potential path of a feared event or a specified function in a system at risk. The lifting of an Interception is subject to the agreement of the safeguarding Entity and is called 'Safeguard authorisation'.

Jr: see Burst safety factor.

Js: see Instantaneous safety factor.

Jt: see Stamping coefficient.

Impact limit (LI): See Article 61.1

L.B.B. (Leak Before Burst): failure mode of a pressure vessel designed to limit the risk of shrapnel projection in the event of any type of structural defect (other than external aggression). Only fluid leakage and its potential dangers need to be considered in this case.

Contracting Authority (CA): The Developer is the legal entity on whose behalf the project has been undertaken. It is responsible for identifying the need and defining the objective, the schedule and the budget. The expected result of the project is the realisation of works with a specific function. The cost of this is borne by the first-level Developer.
Common mode: Failure, external event or human error that invalidates the independence between two elements (function, hardware or software). Common modes can relate to design (or organisation), production and implementation issues

CNES/CSG safeguarding entities: entities implemented or proposed by CNES/CSG for the benefit of the Safeguarding and Intervention Mission (Mission de Sauvegarde et d'Intervention – MSI) and the Surveillance and Alert Mission (Mission de Surveillance et d'Alerte – MSA). These entities are defined in a dedicated Regulatory Instruction.

Ground resource: any ground-based system used for launch preparation, chronology and revalidation activities.

Neutralisation: intervention on the Launch vehicle characterised by the destruction of said Vehicle or instant and permanent termination of thrust in order to put an end to its flight or that of one or more of its stages that is/are no longer functioning correctly.

Risk level: a probabilistic estimate characterising the insecurity of a system with regard to a feared event, expressed by the probability of occurrence of this event.

Nominal: corresponding to the specifications or performances announced by the operator or designer of the space object.

Overall safety objective: control of Risks (in the event of a Delay failure) to ensure the protection of people, property, the environment and public health. The Overall safety objective is defined throughout the trajectory of the Launch vehicle, including the specific MSI part. In particular, it is expressed in terms of reliability objectives for the neutralisation or localization System.

Space object: any object of human origin, functional or not during its launch, its stay in extra-atmospheric space or its return, including the components of a launcher placed in orbit.

Failure: Failure of a component (function, hardware or software) such that it can no longer operate as intended. The term includes Delay failure, Advance failure and erroneous operation.

Human error can cause failures, but is not considered a failure.

Advance Failure: an unwanted function is performed.

Delay failure: failure to perform a function when required.

Withdrawal from service phase: the final phase of the space operation during which actions to secure the space Object are carried out in order to limit the Risks associated with space debris.

Flight phase of a Launch vehicle: the various flight phases of a Launch vehicle are as follows:

- **Launch phase**: cf. Article 1 of the above-mentioned Law on space operations;
- **Recovery phase**: during the Launch phase, a phase beginning with the separation of the recoverable element of the Launch vehicle and ending with its immobilisation on Earth.

Maximum expected operating pressure – the maximum relative pressure that a vessel, a component or a component with fluid under pressure is likely to experience during its operational life, within its operational environment.

Hazardous product or fluid: a product or fluid likely to cause damage by its intrinsic properties (mechanical, physical, chemical, biological, nuclear, thermal, etc.), or by reaction with the surrounding environment. This concept includes in particular all hazardous substances and preparations as defined in current regulations, refrigerated liquefied neutral gases (nitrogen, helium, etc.) as cryotechnical fluids, and hot fluids.

Redundancy: Two or more independent means implemented to perform a given function.

Controlled Re-entry: atmospheric re-entry, destructive or not, of a space Object with a predefined zone of contact or impact on the ground of the object or its fragments.

Controlled Re-entry can be carried out either on site with precision, or by targeting a limited area with a certain level of confidence. Controlled re-entry on site includes offshore sea landings (barge, vessel, ditching, etc.), in accordance with the provisions specified in Article 23 of the Technical Regulation.

Risk: a two-dimensional quantity associated with a specific circumstance in the life of a system, characterising a feared event in terms of the severity of its consequences and the probability of its occurrence.

Technical risk: a Risk of technological, industrial, operational, human or natural origin. An expression used to differentiate Technical risk from any other type of Risk, particularly financial or related to the safety of the Facilities.

Safeguard (general mission of): in accordance with Article 21 of the above-mentioned Law on space operations and Articles R331-10 to R331-19 of the Research Code, all of the provisions intended to manage the Technical risks associated with the preparation and execution of space operations at the Guiana Space Centre, in order to ensure the safety of people and property and the protection of public health and the environment, on the ground and in flight.

<u>Ground safety</u>

All provisions:

- intended to control the technical risks arising from activities taking place on the ground and contributing to the flight of a launch vehicle, including its possible partial recovery at the CSG site;
- relating to supplements to the applicable safety and environmental protection regulations, made necessary by the specific features of the CSG site's activities.

The CSG Safeguarding Rules and the special police power of the President of the National Centre for Spatial Studies shall apply to objects returning from a launch as soon as they arrive within the perimeter of the CSG, including at the port of Pariacabo.

<u>In-flight safety</u>

All the measures designed to control technical risks during the flight of a Launch vehicle controlled from the CSG, including the Controlled re-entry on site phase.

The aim of these provisions is to ensure the safety of people and property and the protection of public health and the environment on the Earth's surface, for aircraft in flight or in outer space, against any damage that may result from the in-flight operation of the said vehicle.

Master plan: document provided for in Article R331-11 of the Research Code, relating to land use at the CSG:

- Summarising the regulatory constraints relating to the safety of people and property, the protection of public health and the environment, and the implementation of equipment linked to the current use of the CSG site and its peripheral zone;

- Characterising each zone (launch zone, industrial zone, natural zone);
- Determining the potential of open areas and their possible future.

Segregation: setting up a physical barrier (protection) or distance (separation) between two material elements.

Security (measures of): measures relating to the protection of people and Facilities provided for by the applicable legislation and regulations, the implementation of which is coordinated by the President of the Centre national d'études spatiales, under Article R331-14 of the Research Code.

Risk system: a system that meets at least one of the following two criteria:

- It contains one or more dangerous products or Fluids;
- It consists of one or more Risk elements.

Launch system: consists of the launcher and the Ground resources interfacing with it.

Neutralisation system: all on-board resources directly involved in Neutralisation of the Launch vehicle in flight.

Safeguard system: consists of the Neutralisation, location, and telemetry systems, including the CNES/CSG Safeguard resources implemented for the benefit of the Safeguard mission of the President of the Centre national d'études spatiales.

On-board Safeguard system: All on-board Neutralisation, location and telemetry systems for the benefit of the Safeguard mission of the President of the Centre national d'études spatiales.

Short-term limit value (STLV): the value of the concentration of a toxic substance in the atmosphere of a workplace, allowed for a maximum staff exposure duration of 15 minutes without Risk of impairment of health. This value is defined by the Labour Code.

Mean occupational exposure limit value (OEL 8 h): the value of the concentration of a toxic substance in the atmosphere of a workplace, permitted for a maximum duration of exposure of staff over the duration of a workstation (8 hours), without risk of impairment of health. This value is defined by the Labour Code.

Launch vehicle: assembly consisting of the launcher and Space objects intended to be put into orbit.

Re-entry vehicle: A Space object that is not part of the Launch vehicle, that is designed to land intact on Earth after an orbital or sub-orbital flight phase.

Risk zone: an area that may be the centre of effects likely to cause damage as a result of the proximity of one or more Risk systems.

Hazard zone: a zone defined by calculation of the distances of effects relating to an identified accident scenario (fire, explosion, etc.) in the context of the hazard study.

ARTICLE 2 – **SCOPE**

This Order is a special police regulation governing the operation of Facilities at the Guiana Space Centre. It defines the administrative police measures applicable to activities carried out within or from the perimeter of the CSG, pursuant to Article L331-6(I.) of the Research Code and Articles R331-10 to R331-13 and R331-18 and R331-19 of the Research Code, without prejudice to the legislation and regulations otherwise applicable.

The Regulatory Instructions and Coordination Instructions apply to staff at all CSG sites. Staff attached to external companies but working within the boundaries of the CSG shall continue to report to their employer with regard to

disciplinary aspects.

ARTICLE 3 – **CHECKING PROCEDURES**

Any person referred to in Article R331-10 of the Research Code shall designate a contact person for the agents authorised to carry out the checks necessary for fulfilment of the special police mission for the operation of CSG Facilities, under Article R331-18 of the Research Code. In this connection, the President of the Centre national d'études spatiales may take any measure deemed necessary for the performance of this mission.

Authorised officers have access to all of the land and facilities of the CSG, under the conditions laid down in Article L331-6(III.) of the Research Code.

Their presence is mandatory in the launch centres during the final launch chronology and/or during a Controlled re-entry on site to the CSG or a Recovery phase, in order to check the processing of any particularities and hazards compromising Safeguard and Security, in real time, in close liaison with the representatives appointed by the operator. In this context, the operator shall provide the authorised agents with the necessary technical and logistical resources and information.

The content and conditions of the check shall be specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

CHAPTER I.2 ORGANISATIONAL AND PROFESSIONAL REQUIREMENTS

ARTICLE 4 – GENERAL OBLIGATIONS OF FACILITY OPERATORS OR HOLDERS

Any person referred to in Article R331-10 of the Research Code shall be subject to the following obligations:

- To manage the configuration of their Facilities and their developments.
- To operate and maintain these Facilities under the requisite safety conditions and in compliance with environmental requirements.
- To install a Safeguard entity and a Security Correspondent, specific to its Establishment as defined in Article 1 of this Order.
- To keep the President of the Centre national d'études spatiales informed without delay of any modification to equipment, systems, configurations, operation plans or procedures, as well as any technical fact, incident or accident likely, within the meaning of Article 25 of this Order, to affect the safety of people and property and the protection of public health and the environment, or generate new Risks, including from the feasibility study phase.
- To obtain the opinion of the President of the Centre national d'études spatiales on any regulatory studies concerning activities likely, within the meaning of Article 25 of this Order, to undermine the Safety of people and property and the protection of public health and the environment, or generate new Risks.

ARTICLE 5 – ORGANISATION, FACILITIES AND RESOURCES

All persons referred to in Article R331-10 of the Research Code must have the necessary skills and resources to prepare and implement the activities that they carry out, in particular:

- appropriate organisations and facilities for the manufacture, integration, testing and preparation of the Launch vehicle, execution of the launch operation and, where applicable, the recovery, rehabilitation and pre-flight revalidation phase;
- qualified industrial processes and procedures;
- qualified staff in appropriate numbers;
- equipment, tools and materials suitable for the proposed activity;
- documentation relating to tasks, responsibilities and procedures;
- access to the relevant data for preparation of the proposed operation;
- recording, exploiting and archiving technical data;
- processing of Technical facts.

ARTICLE 6 – SUBCONTRACTORS, SUPPLIERS AND CUSTOMERS

Any person referred to in Article R331-10 of the Research Code shall:

- inform their subcontractors and suppliers of the application of this Order within the perimeter of the CSG;
- have the provisions of this Order applied, under their responsibility, by their subcontractors and suppliers within the perimeter of its Establishment.

The space operator must also have the provisions of this Order applied, under its responsibility, by its customers and, where appropriate, by the Payload manufacturer.

ARTICLE 7 – **PHOTOGRAPHY**

Implementation of the rules on photography within the CSG is detailed in a Coordination Instruction.

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PART II. ACCESS AND TRAFFIC RULES

Article 8 – Relation to the regulations on the safety of **FACILITIES**

The access and traffic regime provided for in this Order is without prejudice to the application of the regulations relating to activities of vital importance, in particular the Order of 2 June 2006 designating space as a sector of activities of vital importance, and the security measures linked to the classification of the Guiana Space Centre as an Establishment with Restricted Access by the General Secretariat of Defence and National Security, under the terms of which the majority of the Facilities distributed within the perimeter of the CSG are also classified as Facilities of Vital Importance. Facilities classified as Facilities of Vital Importance by the General Secretariat of Defence and National Security (SGDSN) are subject to special protection measures. These Facilities of Vital Importance are established in protected areas (Articles 413-7 and 413-8 of the Criminal Code).

Any person entering the CSG perimeter must be formally identified and authorised in accordance with Interministerial General Instruction No 6600/SGDN/PSE/PPS of 7 January 2014 on the security of vitally important activities and Interministerial Instruction No 11155/SGDSN/AIST/PST/CD-SF of 7 November 2012 on protection of the scientific and technical potential of the nation.

To this end, strict rules concerning both access to and traffic in CSG Facilities are laid down in Regulatory Instructions.

The President of the Centre national d'études spatiales coordinates and ensures the implementation of this Regulation in the Facilities within the perimeter of the CSG and follows any necessary Coordination Instruction in this regard, in accordance with the provisions of Article R331-16 of the Research Code.

ARTICLE 9 – **ACCESS FOR PEOPLE AND VEHICLES**

All people and vehicles entering a Facility located within the perimeter of the CSG are formally identified, checked and authorised.

The access authorisation for people and vehicles takes the form of a staff badge and a vehicle pass. The badge shall indicate its period of validity. The badge must be worn conspicuously, at chest level, at all times.

The badge, owned by the Centre national d'études spatiales, is issued on behalf of the President of the Centre national d'études spatiales and must be returned in accordance with the procedures specified when it was issued or at the request of the Centre national d'études spatiales.

Completion of the Safeguard training course provided for in Article 13 of this Order is a condition for obtaining or renewing this access badge.

The specific conditions of access of persons and vehicles to the Facilities are specified by Regulatory Instruction of the President of the Centre national d'études spatiales and their delegates.

Authorised agents may at any time, for safety and security reasons, search vehicles, in the presence of the driver, at exits and entrances to fenced and filtered areas of the CSG. These searches may also be carried out within the Establishments, in agreement with the Heads of the Establishments concerned.

For the same reasons, these officers may have a vehicle removed or moved in the event of troublesome parking.

ARTICLE 10 – **ACCESS TO CERTAIN FACILITIES**

People's access to certain Facilities or areas shall be controlled by programming an electronic card according to criteria relating to:

- the safety and Safeguard measures implemented on the premises or in the area concerned;

- the need of the staff member concerned to gain access, in order to conduct their activity;
- the defence clearance required for access to certain Facilities or areas or to take part in certain activities.

The need for access to these Facilities or areas shall be the subject of a programming application submitted to the President of the Centre national d'études spatiales by the head of the Establishment concerned.

ARTICLE 11 – **ACCESS TO A RISK ZONE**

In a Risk zone, a means of constant communication is required between the Safeguard entity concerned and the people carrying out the activity in the zone. In the event of activity on a Risk system, a team of at least two people is required. Nevertheless, the number of people permitted to be in the danger zones of a Risk operation simultaneously shall be as small as possible.

In the event of activity in a Risk zone without intervention on a Risk system, a single person may intervene. The required means of constant communication with the relevant Safeguard entity may be replaced in this case by a constant communication link with the CSG fire and rescue centres.

Access to certain zones may be subject to the nature of the Risks generated by the activities and the use of appropriate collective or individual protective equipment.

ARTICLE 12 – **PRECAUTIONARY MEASURES**

In order to preserve the safety of assets and people, the President of the Centre national d'études spatiales may immediately apply any precautionary measure necessary in reaction to any non-compliance identified by the authorised officials.

These precautionary measures may give rise to the temporary or permanent withdrawal of the CSG access badge in the event of serious non-compliance. In the event of temporary withdrawal of the badge, the holder's return to the CSG site may be subject to appropriate security training.

ARTICLE 13 – **SAFEGUARD TRAINING**

Any person likely to travel without a guide in Risk zones within the CSG perimeter must receive Safeguard training, the content and conditions of which are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

ARTICLE 14 – **ACCESS CONTROL MEASURES**

Certain areas and premises are subject to access control measures employing electronic and video surveillance. To this end, the President of the Centre national d'études spatiales shall specify by Regulatory Instruction the various security systems and their installation and implementation procedures to ensure overall consistency and technical compatibility with existing systems and networks.

ARTICLE 15 – **TRAFFIC RULES WITHIN THE CSG PERIMETER**

The Highway Code applies to all roads and tracks within the CSG perimeter. The special police powers of the President of the Centre national d'études spatiales in respect of traffic shall be exercised, without prejudice to the general police powers of the Prefect of Guiana in respect of public traffic.

The President of the Centre national d'études spatiales may be called upon to close or restrict public traffic on some or all of the roads or tracks within the CSG perimeter, for Safeguard or security reasons associated with activities conducted within the CSG.

The stopping and parking of vehicles of all categories is prohibited on the road shoulders defined by the Regulatory Instruction of the President of the Centre national d'études spatiales. Regulatory signs indicate this prohibition.

ARTICLE 16 – EVACUATION OF A FACILITY OR ZONE

In accordance with Article R331-11 of the Research Code, the President of the Centre national d'études spatiales may, with regard to the performance of an activity posing a serious danger to people or property or to the protection of the environment or public health, carry out the evacuation of any Facility or any built or natural area located within the perimeter of the CSG.

The activities covered include, in particular, operations relating to the transfer of Payloads or of the launcher, to the launch chronology and during a Controlled re-entry on site to the CSG or a Recovery phase.

The content and conditions for the evacuation in launch chronology are specified in the Regulatory Instruction of the President of the Centre national d'études spatiales.

ARTICLE 17 – SALVATION ISLANDS: ACCESSING, MOVING AROUND, STAYING AND EVACUATION

The conditions for accessing, moving around and staying on the Salvation Islands, which include operational technical facilities related to space activities and facilities of a hotel and tourist nature and which are subject in particular to a protection easement concluded with the Conservatoire de l'espace littoral et des rivages lacustres (coastal and riverbank conservatory), are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

The President of the Centre national d'études spatiales may be called upon to prohibit access to these islands, as well as to order their evacuation in accordance with the conditions laid down in Article 16 of this Order. In any event, people not involved in the launch activity are evacuated from the Islands during the launch chronology, during a Controlled re-entry on site to the CSG, or during a Recovery phase.

ARTICLE 18 - ACCESS TO AND EVACUATION FROM THE LEISURE ZONE

The President of the Centre national d'études spatiales may be called upon to prohibit access to the leisure zone, which notably includes the CSG aerodrome and sports and community facilities, and to order its evacuation under the conditions laid down in Article 16 of this Order.

In any event, the leisure zone is evacuated during the launch chronology, during a Controlled re-entry on site to the CSG, or during a Recovery phase.

ARTICLE 19 – ROAD TRANSPORT OF DANGEROUS GOODS

The transport of dangerous goods by road within the CSG perimeter is governed by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

In the event of it being impossible to implement the regulatory provisions of the ADR, due to the specificity of the Space objects or their constituent elements, the transport of these objects or elements is subject to specific Safeguard and security measures, which are specified by the Regulatory Instruction and Coordination Instruction of the President of the Centre national d'études spatiales.

Any plan for the delivery, within the CSG perimeter, of Class 1 objects, excluding articles classified as 1.4S in transport packaging, and Class 7 objects, within the meaning of ADR, shall be the subject of a specific access request submitted to the President of the Centre national d'études spatiales no later than 30 days before the expected date of their arrival.

PART III. RULES ON THE ESTABLISHMENT OF FACILITIES

ARTICLE 20 – ESTABLISHMENT OF FACILITIES

It is reminded that the ownership of the land on which the CSG was established, as well as that of the Salvation Islands were transferred to the Centre national d'études spatiales by the State by administrative deed, dated 20 October 1971. Part of this land is made available to the European Space Agency by the Centre national d'études spatiales at the request of the State, within the framework of the above-mentioned CSG Agreement.

Any creation or modification of a Facility or construction within the CSG perimeter subject to a building permit, as well as any modification of a Risk facility or facility located in a Hazard zone, or which might affect the tracks and major networks of the CSG must comply with the scheme relating to the location of Facilities, tracks and networks, ordered by Regulatory Instruction of the President of the Centre national d'études spatiales, the provisions of this PART III, as well as those of CHAPTER V.1 and CHAPTER V.2 of this Order.

ARTICLE 21 – PROVISION OF LAND

The President of the Centre national d'études spatiales shall delimit the perimeter of the land assigned to the planned establishment, in coherence with the Environmental Code and the Labour Code, in particular the provisions on classified installations for environmental protection and pyrotechnic safety.

The Developer of the Facility shall formalise the boundary of the land upon construction by an enclosure fence or appropriate signage.

The President of the Centre national d'études spatiales shall keep the reference plan of the land provided up to date.

ARTICLE 22 – OPERATION OF THE FACILITIES

Any holder or operator of a Facility within the boundaries of the land assigned to it shall be obliged to ensure the overall maintenance of the boundaries and to maintain the signage or fencing formalising it.

ARTICLE 23 – CHANGE OF OPERATOR

Any proposed change of operator of a Facility at the CSG shall be submitted to the President of the National Centre for Spatial Studies, who shall check, in particular, that the new operator complies with the provisions laid down in Article 5 of this Order.

ARTICLE 24 – CESSATION OF ACTIVITY

Any holder or operator of a Facility whose operation ceases shall, at their own expense and before cessation of activity, restore it to such a condition that it cannot adversely affect the safety of people and property and the protection of public health and the environment and is compatible with the CSG Master Plan. Before cessation of activity, the President of the National Centre for Spatial Studies may, in this regard and without prejudice to the application of legislation relating to facilities classified for environmental protection, require the Facilities to be rehabilitated, dismantled or destroyed and the land affected to be restored to its original state, at the expense of the holder or operator.

PART IV. GENERAL SAFEGUARD RULES

CHAPTER IV.1 GENERAL SAFEGUARD OBJECTIVES

ARTICLE 25 – RISK CLASSES RELATING TO ACTIVITIES CARRIED OUT ON THE GROUND AND IN FLIGHT

Two categories of risk class are defined within the scope of this Order, depending on the severity of the damage:

Risk classes	*Definition of damage*
Risk with catastrophic consequences	• **Immediate or subsequent loss of human life** • **Permanent disability** • **Irreversible damage to public health**
Risk with serious consequences	• **Serious injuries to people not resulting in loss of life or permanent disability** • **Reversible damage to public health** • **Significant damage to property:** - Total or partial destruction of public or private property - Total or partial destruction of a Facility critical to the launch operation • **Significant damage to the environment**

It is specified that catastrophic environmental Risks are included in the class of Risk with catastrophic consequences for human life and public health, because they result in one of the forms of damage defined for this class.

ARTICLE 26 – REQUIREMENTS FOR ACTIVITIES CARRIED OUT ON THE GROUND

Principles:

Any Risk system identified under the conditions laid down in Articles 32 to 35 of this Order and implemented in the context of activities carried out on the ground must meet a clearly identified reliability objective that is compatible with the qualitative and quantitative requirements below. This reliability objective must explicitly contribute to the safety of people and property and the protection of public health and the environment.

It must be demonstrated that the objective is being met, taking into account the aspects relating to the equipment and its implementation, and potentially also the rules and methods of safe operation recognised in the Guide to best practice provided for in Article 54 of the Technical Regulation.

Qualitative requirements:

1. For any Risk activity conducted within the perimeter of the CSG or from the CSG, space systems, security systems, integrated stages and associated ground systems must meet the following requirements:

Activity presenting risks with serious consequences: Single failure criterion

No fault (Simple failure or human error) should present a Risk with serious or *a fortiori* catastrophic consequences (the so-called 'Fail Safe' (FS) character).

However, compliance with the Single failure criterion is not required:

- for a Launch system from the moment the launch operation becomes irreversible until it has been made safe in the event of an aborted launch attempt;
- for a space object once it has been returned to the CSG site until it has been made safe;
- for the structural elements of a launcher or Payload in the event that the application of this criterion is not feasible under economically acceptable conditions, taking into account the state of knowledge and practices and the vulnerability of the environment in which the launch vehicle is likely to operate.

Activity presenting risks with catastrophic consequences: Double failure criterion

No combination of two failures (Failure or human error) may present a catastrophic risk (FS/FS).

The Double failure criterion does not apply to the combination of two Human errors.

2. The qualitative requirements laid down in the first subparagraph above do not apply to structural elements, which are dimensioned in accordance with appropriate standards and engineering methods, in order to ensure an equivalent level of safety. A Regulatory Instruction from the President of the Centre national d'études spatiales specifies these standards and methods.

Qualitative requirements:

For any Risk activity with catastrophic consequences carried out within the perimeter of the CSG, the maximum permissible probability of there being at least one victim (Collective risk), taken into account for the sizing of launch systems, test benches and associated technical resources, is 10^{-9}/h per hour of exposure in the presence of staff.

ARTICLE 27 – **REQUIREMENTS FOR ACTIVITIES CARRIED OUT IN FLIGHT**

Principles:

Any Risk system identified under the conditions laid down in Article 36 of this Order and implemented in the context of the flight must meet a clearly identified reliability objective that is compatible with the qualitative and quantitative requirements below. This objective of reliability must explicitly contribute to the safety of people and the protection of public health and the environment, as well as to the protection of property.

It must be demonstrated that the reliability objective is being met, taking into account the aspects relating to the equipment and its implementation, and potentially also the rules and methods of safe operation recognised in the Guide to best practice provided for in Article 54 of the Technical Regulation, as well as the Guide to best practice associated with this document.

Qualitative requirements

Activities exposing persons to risks with catastrophic or serious consequences must meet the Double failure criterion (FS/FS), defined as follows: no combination of two failures (Breakdown or human error) shall present a Risk with catastrophic or serious consequences. An exception is specified in Article 66.3 concerning the impact of light fragments affected by the wind.

Activities posing risks with serious consequences may, by decision of the President of the Centre national d'études spatiales, meet only the criterion of Single failure if they expose only Facilities or the environment.

The Double failure criterion does not apply to the combination of two Human errors.

Quantitative requirements

The quantitative requirements relating to the flight fall within the general framework laid down by the Technical Regulation and may be specified by a dedicated Regulatory Instruction.

ARTICLE 28 – **SOFTWARE**

Software contributing to the safety of people and property and to the protection of public health and the environment; in particular, software constituting safety barriers, shall be subject to criticality analyses to infer the design, development and validation requirements and risk-reducing measures appropriate to their criticality. Criticality analyses include the contribution of external components and/or libraries and support tools (development tools, checking tools or parameterisation tools).

Risk software with potentially catastrophic or severe consequences (both on the ground and in the MSI phase) must be developed following a software security standard appropriate to their criticality. The supporting documents for the criticality analysis, the choice of the standard and its application shall be submitted to the President of the Centre national d'études spatiales in accordance with the provisions laid down in CHAPTER IV.2 of this Order.

CHAPTER IV.2 SAFEGUARD PROCEDURE

ARTICLE 29 – **SAFEGUARD SUBMISSION PROCESS**

An iterative and continuous file submission process relating to Safeguarding ('Safeguard submission') enables the President of the Centre national d'études spatiales to check the compliance of any person referred to in Article R331-10 of the Research Code with the provisions of this Order.

This person shall, for each Risk activity that they intend to conduct:

- identify and assess the Risks defined in Article 25 of this Order;
- establish, where appropriate, a risk reduction programme.

It shall provide the President of the Centre national d'études spatiales, as soon as possible and in writing, with a file including the demonstration of compliance with the provisions specific to each type of Safeguard submission, as provided for respectively by the provisions of Articles 32 to 36 of this Order.

ARTICLE 30 – **TREATMENT OF AMENDMENTS**

Any modification of a launcher or a Space object that has carried out a Controlled re-entry on site onto the ground, a Payload, a Ground facility and Ground resource, whose use or implementation present Risks with serious or catastrophic consequences, as defined in Article 25 of this Order, shall be the subject of a new Safeguard submission, in accordance with the procedure laid down in Article 29 of this Order.

ARTICLE 31 – **TREATMENT OF NON-CONFORMITIES**

In the event of it being impossible to comply with one or more provisions of this Order, any person referred to in Article R331-10 of the Research Code may submit an exemption request to the President of the Centre national d'études spatiales in writing, accompanied by a supporting file that must specify and justify:

- the impossibility, in the case in question, of taking all of the measures necessary to establish, maintain or restore compliance with the provisions of this Order;
- the measures taken to bring themselves as close as possible to compliance with the provisions of this Order;
- the Level of residual risk resulting from the non-compliance.

The President of the Centre national d'études spatiales may, by express decision, grant an exceptional exemption, notably relating to the conditions of the current operational environment.

ARTICLE 32 - **CASE OF GROUND FACILITIES**

The Declarant is clearly identified. In the absence of identification, the Declarant is the Developer in the context of a new Facility or the operator concerned in the event of modification of an existing Facility.

The Declarant shall submit to the President of the Centre national d'études spatiales the file provided for under Article 29 of this Order, which justifies compliance firstly with the provisions of this Article and, secondly, with the rules applicable to the ground Facilities provided for in CHAPTER V.1 and CHAPTER V.2 of this Order

Phase 0 – Feasibility

The feasibility file must include a preliminary Risk analysis based on the following:

- The characteristics relating to:
  - the nature and hazards of the products envisaged;
  - the maximum quantities of each of these products in the Facility;
  - the list of Risk systems, together with their preliminary description;
  - the description of the operating procedures and technical options envisaged, in particular:
    - the type of activities carried out at the Facility;
    - any associated material resources used;
    - the operational constraints associated with the activities, including zone evacuations, incompatibility of activities or limitation of the number of people present;
    - the interfaces of the Facility with existing routes and major networks;
- the reference trajectories in the event of the installation of a launch area.

This analysis must demonstrate:

- that the envisaged installation of the Facility complies with Article 20 of this Order;
- compliance with the legal and regulatory provisions applicable to facilities classified for environmental protection and pyrotechnic safety.

Phase 1 – Design

The design file must include:

- the files defining the Facility and its equipment incorporating the specifications and remarks made by the president of the Centre national d'études spatiales at the end of phase 0;
- the operating procedures, in sufficient detail that it is possible to monitor the degree to which the operational constraints defined in the feasibility phase have been taken into account;
- the regulatory studies needed to obtain authorisations to operate under legislation relating to installations classified for environmental protection and pyrotechnic safety, under the conditions laid down in that legislation. These regulatory studies shall be provided to the President of the Centre national d'études spatiales, under the conditions laid down in the Coordination Instruction issued by the latter as part of its task of coordinating security measures, as defined in Article L331-6(II) of the Research Code.

Phase 1 is closed upon receipt of the building permit.

Phase 2 – Execution

The Authorised agents must be able, at any time during the construction phase of the Facility, under the conditions laid down in Article 3 of this Order:

- to carry out site visits;
- to check and confirm the operability of the Facility in accordance with the operational deployment plan and the procedures laid down; as such, they shall assist in the acceptance and technical and operational qualifications of systems whose malfunction may be detrimental to the safety of people and property and to the protection of public health and the environment;
- Check that the Facilities have no negative effect on the reliability and safety of roads and large networks.

Phase 2 is closed upon completion of technical acceptance of the Facility.

Phase 3 – Implementation

The Declarant shall submit a file to the President of the Centre national d'études spatiales attesting to its control of the configuration of any Facility at Risk and to the maintenance over time of compliance with the provisions of this

Order. The opening of the Phase 3 folder submission is independent of the closure of Phases 0 to 2 mentioned above. It must begin as soon as possible, as soon as the definition of the Facility and its validation and operating procedures are sufficiently known.

The implementation file must include:

- the implementation guidelines;
- the implementation procedures;
- the safety instructions relating to the CSG site and the activities taking place there.

ARTICLE 33 – CASE OF GROUND RESOURCES

The declarant, or any person responsible for the design or development of a Ground resource used or intended for use in or on an installation at the CSG and capable of generating a risk within the meaning of Article 25, shall submit to the President of the National Centre for Spatial Studies the file provided for under Article 29 of this Order, which shall include the justification for compliance with the provisions of this Article and the rules applicable to the Ground resources provided for in CHAPTER V.1 and CHAPTER V.2 of this Order.

Phase 0 – Feasibility

The feasibility file must include:

- the specifications of the Ground resource project;
- a description of the choices and technical solutions envisaged for the Ground resource project and a description of the operating procedures;
- the list of Risk systems, together with their preliminary description;
- the nature and dangers of the activities envisaged;
- A preliminary analysis of the Risks associated with the implementation of activities, identifying system-level Risks, circumstances and potential Risk events;
- the list of applicable legislation, regulations, standards and specifications.

Phase 1 – Design

The design file must include:

- the files defining the resource and its equipment, incorporating the specifications and remarks made by the president of the Centre national d'études spatiales at the end of phase 0;
- the assessment of the design choices adopted;
- the dimensioning notes of the medium and its equipment, in accordance with appropriate standards and engineering methods;
- identification of the Risks and the studies demonstrating that they have been minimised;
- The qualification plans for risk systems.

Phase 2 – Execution/qualification

The execution/qualification file must include:

- further Risk analysis and Risk level assessment of the system and associated equipment to demonstrate achievement of the Safeguard objectives;

• the management procedures for critical parameters;
• the assessment of the qualification results;
• the operational plan for implementation of the system and the Risk activities resulting from it.
Reports and evidence of compliance with the applicable legislation, regulations, standards and specifications identified in phase 0.

Phase 3 – Implementation

The implementation file must include:

• the implementation specifications, including security measures;
• the operational plans.
• The President of the Centre national d'études spatiales may ask to be sent the following documents:
• The user manual for the Ground resource;
• The maintenance manual;
• The procedures for use of the Ground resource;
• The acceptance reports for all equipment and test certificates for pressure vessels;
• Authorisations for the possession and use of equipment subject to administrative authorisation in the context of application of the relevant regulations (example: object emitting ionising radiation).

ARTICLE 34 – **CASE OF PAYLOADS**

The Payload manufacturer, under the responsibility of the launch operator, shall submit to the President of the Centre national d'études spatiales the file provided for under Article 29 of this Order, which shall include proof of compliance with the provisions of this Article and the rules applicable to Payloads provided for in CHAPTER V.1 and CHAPTER V.3 of this Order.

Where the system has been designed from a system that has already been the subject of a submission file, the new submission may be made 'by difference'.

Phases 1,2 and 3 may be carried out in parallel, since the opening of a phase is not conditional upon the closure of the previous phase.

Phase 0 – Feasibility

The feasibility phase is optional, except for new platforms using innovative technologies. The feasibility file must include:

- the project specifications;
- a description of the choices and technical solutions envisaged for the project and a description of the operating procedures;
- the list of Risk systems, together with their preliminary description;
- the nature and dangers of the activities envisaged;
- the preliminary analysis of the Risks associated with the implementation of activities, identifying system-level Risks, circumstances and potential Risk events;
- the list of legislation, regulations and standards applicable to the project.

Phase 1 – Design

The design file must include:

- A detailed description of the Risk systems, their command and control circuits and their associated ground equipment. This description shall also include the constituent elements of the systems as well as the reliability data making it possible to assess the Level of Risk.
- The envisaged frequency plan of the transmitters and receivers accompanied by the emissions characteristics (spectrum, power, modulation, coding, etc.).
- The dimensioning notes for the project Risk systems and for its equipment according to appropriate engineering methods.
- Any specific study or calculation note permitting assessment of the characteristics of the Risk systems.
- Complete identification of the Risks and the studies demonstrating that they have been minimised;
- The risk analysis.
- Risk systems qualification plans covering all life phases of the Payload on the ground. For Payloads arriving at the CSG after a launch, the qualification of Risk systems must also cover the phases of life in flight.
- In the case of reused elements, the plan for maintenance, repairs and post-flight acceptance tests to be carried out before each Risk activity or reuse.

Phase 2 – Qualification

The qualification file must include:

- the results of the qualification tests, partial or global, of the Risk systems;
- the plan of the approval tests, partial or global, of the Risk systems;
- any specific study or calculation note permitting assessment of the characteristics of the Risk systems (notably the fracture analyse);
- the document defining the interfaces between the Payload and the associated equipment and the various Facilities of the CSG;
- further Risk analysis and Risk level assessment of the system and associated equipment to demonstrate achievement of the Safeguard objectives;
- where appropriate, changes to the frequency plan and emission characteristics;
- the operational plan for implementation of the system and the Risk activities resulting from it also cover nominal and degraded cases for all life phases of the Payload on the ground.

Phase 3 – Implementation

The implementation phase shall start no later than six months before the launch and shall be closed before the start of each of the Risk Activities. The start of this phase is delayed to 2 months before the launch in the case of Payloads without Risks with catastrophic consequences. The implementation file must include:

- The procedures for conducting activities, including procedures relating to making safe and emergency procedures in the event of an incident. These procedures must implement the following measures:
    - identify Risk activities;
    - take into account the specificities of the CSG (sites, resources, designations, etc.);
    - specify, for each stage, the number and function of the indispensable people in the danger zones;
    - specify the list of resources and products used;
    - indicate the duration of the activities, including those for making safe, as well as any interruptions;
- analysis of compliance with the Safeguard requirements for the launcher on the ground for the activities of configuring Payloads and making them safe in the launch area;

- results of the approval tests of certain components of Risk systems, in particular the test certificates of gas pressure vessels; these documents may be provided when the equipment arrives within the CSG perimeter;
- authorisations for the possession and use of equipment subject to administrative authorisation (example: object emitting ionising radiation);
- medical fitness certificates for staff working on certain Risk systems, in particular those emitting ionising radiation or containing toxic products. These documents may be provided when said systems arrive within the CSG perimeter;
- Staff clearance certificates for the handling of pyrotechnic products;
- The final version of the satellite operations plan, including in particular the final list of procedures, the operation sheets and the operations schedule.

In the case of a Space object that has made a Controlled re-entry on site to the CSG:

- a status report of the barriers and safety resources, in orbit before the irreversible phase;
- the status report of the Risk systems and in particular the barriers and Intercepts before each Risk activity or reuse;
- the post-flight acceptance test reports for the reused elements, justifying a level of safety equivalent to that of entry into service on the ground and its reintegration for another flight.

ARTICLE 35 – CASE OF LAUNCHERS OR SPACE OBJECTS HAVING MADE A CONTROLLED RE-ENTRY ON SITE ONTO THE GROUND

The operator, or any person responsible for the design or development of the launcher or the Space Object having carried out a Controlled re-entry on site to the CSG, in particular the Developer, shall submit to the President of the Centre national d'études spatiales the file provided for under Article 29 of this Order, which shall include evidence of compliance with the provisions of this Article as well as the rules applicable to Launch vehicles and, where applicable, Re-entry vehicles, provided for in CHAPTER V.1 and CHAPTER V.3 of this Order.

In the case of a Space object that has made a Controlled re-entry on site to the CSG, the operator will provide guarantees of its safety until its departure from the CSG or before the operations aimed at its reintegration on another launch. Reusable launcher elements as well as their implementation, refurbishment and ground revalidation operations are subject to this Safeguard submission process.

Phase 0 – Feasibility

The feasibility file must include:

- the project specifications;
- a description of the technical choices and solutions envisaged for the project;
- the list of Risk systems, together with their preliminary description;
- the safety objective Allocations;
- an initial quantitative assessment of the Risk levels of the various technical design options envisaged;
- the preliminary analysis of the Risks associated with the design and implementation of the project, identifying system-level Risks, circumstances and potential Risk events;
- identification of critical aspects vis-à-vis the safety of people and property and the protection of public health and the environment;
- the Risk prevention principles to be applied;
- the list of applicable legislation, regulations, standards and specifications.

Phase 1 – Design

The design file must include:

- the assessment of the design choices adopted;
- identification of the Risks and the preliminary studies demonstrating that they have been minimised;
- the qualification rules applicable to Risk systems and to Safeguard chains in particular;
- the qualification plans for Systems classified as 'Risk' covering all phases of life on the ground;
- in the case of reused elements, the plan for maintenance, repairs and post-flight acceptance tests to be carried out before each Risk activity or reuse.

Phase 2 – Execution/qualification

The execution/qualification file must include:

- further Risk analysis and Risk level assessment of the system and associated equipment to demonstrate achievement of the Safeguard objectives;
- the management procedures for critical parameters;
- the assessment of the qualification results of equipment classified 'Risk';
- the operational plan for implementation of the system and the Risk activities resulting from it cover nominal and degraded cases for all life phases on the ground.

Phase 3 – Implementation

The implementation file must include:

- The list of control and implementation activities of the system, which must cover all stages:
    - preparation and launch;
    - safety repairs, passivation and decontamination;
    - maintenance, repairs and post-flight acceptance tests of reusable elements;
    - or the test for test specimens, from removal of the Risk components from storage to the start or end of the test;
    - as well as the refurbishment of the launch set or test bench;
- the finalised operational plans. In the case of reusable elements: finalised operational plans for making safe, passivation, decontamination, maintenance, repair and revalidation of elements;
- the implementation procedures covering Nominal and degraded situations;
- the status report of the Risk systems and in particular the barriers and Intercepts for the elements returning to Earth after a Flight phase before each Risk activity or reuse;
- the post-flight acceptance test reports for the elements to be reused, to justify a level of safety equivalent to that of initial entry into service on the ground and its reintegration for another flight.

The President of the Centre national d'études spatiales may ask to be sent the following documents:

- the specifications for commissioning the launcher and its stages or the test specimen;
- The acceptance reports for all equipment and test certificates for pressure vessels;
- Authorisations for the possession and use of equipment subject to administrative authorisation in the context of application of the relevant regulations (example: object emitting ionising radiation).

The launch operator shall submit the final document setting out the standard operating procedures and standard operating plans to the President of the Centre national d'études spatiales.

Any modification of a standard procedure into a specific procedure shall receive the approval of the Safeguard entity prior to submission to the President of the Centre national d'études spatiales.

ARTICLE 36 – **CASE OF FLIGHT SAFEGUARD**

The operator, or any person responsible for the design or development of the launcher or the Re-entry vehicle, in particular the Developer, shall:

- Submit to the President of the Centre national d'études spatiales the file provided for under Article 29 of this Order, which includes proof of compliance with the provisions of this Article as well as the rules applicable to launchers or Re-entry vehicles provided for in PART VI of this Order, notably with regard to equipment contributing to the Safeguard, the planned trajectory of the launcher or Re-entry vehicle, equipment adjustment data and algorithms contributing to the Safeguard or any other data deemed relevant by the President of the Centre national d'études spatiales in the context of the Safeguard analysis.

- Provide all information, data and technical facts necessary for the exercise of its tasks under this Order, as defined in Article 69 and Article 70 of this Order.

The Safeguard submission process addressed by this Order makes it possible in particular to meet the global requirements of the Danger Study requested under the Technical Regulation and to decline them.

a) Feasibility, design and execution phases

The operator, or any person responsible for the design or development of the launcher or the Re-entry vehicle, in particular the Developer, shall submit a file to the President of the Centre national d'études spatiales comprising:

- the list of Risk functions or Equipment systems impacting upon the Safeguard and Intervention Missions defined in Articles 69 and 70 of this Order;
- the configuration of the missions envisaged: version of the launcher or re-entry vehicle, types of mission, trajectories and associated Ground resources, under the Safeguard aspect;
- the Safeguard approaches for which they are responsible, contributing to the safety of people and property and the protection of public health and the environment;
- the design and construction of systems contributing to Flight safeguard missions in accordance with the provisions of PART VI of this Order.

b) Preparation phases for launch and/or controlled re-entry on site

The operator, or any person responsible for the design or development of the launcher or the Re-entry vehicle, in particular the Developer, shall submit a file to the President of the Centre national d'études spatiales comprising:

- the mission configuration (version of the Launch vehicle, type of mission, trajectory and associated Ground resources, under the Safeguard aspect;
- information and data enabling implementation of the applicable Safeguard rules and calculations;
- information and data attesting to the correct operation of the On-board safeguard system;
- Information and data permitting checking of the reservation declaration for the Nominal impact zones for stages or for the controlled re-entry on site of stages or other Space objects, for the benefit of air and sea users.

c) Launch, decommissioning and/or Controlled re-entry on site phases

The launch or Re-entry vehicle operator shall send the President of the Centre national d'études spatiales a file containing:

- information and data enabling implementation of the applicable Safeguard rules and calculations;
- information and data enabling ground and atmospheric Risks caused by the Launch vehicle or Re-entry vehicle to be managed during all flight phases;
- information and data enabling information to be prepared and transmitted relating to the impact zone of dangerous elements or products, as part of the emergency plans.

PART V. SAFEGUARD RULES APPLICABLE ON THE GROUND

CHAPTER V.1 COMMON RULES

ARTICLE 37 – GENERAL GROUND SAFEGUARD RULES

The rules of this PART V apply to the control of Risks for activities carried out on the ground, on Ground resources and Facilities, the launch vehicle or space objects having carried out a Controlled re-entry on site onto the ground, and Payloads with the exception of activities carried out on the ground during flight which fall under PART VI of this Order.

In order to ensure the safety of people and property and the protection of public health and the environment, the design, construction and implementation of the Ground and on-board systems classified as 'Risk' in accordance with Article 25 of this Order shall be based on:

- the reliability of those systems and compliance with the safety factors meeting the operational safety specifications and the Safeguard requirements;
- the installation of Safety barriers and Intercepts at the disposal of the Safeguard entity at the Facility concerned; viewing or consulting status reports of the interceptions, making it possible to check the configuration of the Risk systems;
- the implementation of procedures, remote controls and automation that limit the number of people exposed;
- The use of appropriate personal protection for the risks incurred to ensure the safety of exposed people.

ARTICLE 38 – ORGANISATION OF ACTIVITIES

On each of the Facilities located within the CSG perimeter, the organisation of ground activities in the production, launch campaign, Controlled re-entry on site, or testing phases, must include a Safeguard entity.

The Safeguard function is ensured at all times thanks to the installation of a standby system and constant monitoring of safety alarms.

Any person referred to in Article R331-10 of the Research Code shall send the President of the Centre national d'études spatiales the operational and security organisation that they have put in place.

On a site (building, platform, workstation, etc.) where a Risk activity takes place, this shall be indicated to people outside the activity by clear signage.

The nature, place and start and end times of any activity whose risks extend beyond the perimeter of the Establishment shall be reported to the President of the Centre national d'études spatiales.

ARTICLE 39 – PROCEDURES FOR CONDUCTING ACTIVITIES

All action or intervention processes relating to the safety of people and property and the protection of public health and the environment carried out by the persons referred to in Article R331-10 of the Research Code shall be formalised in writing in the form of:

- procedures for nominal cases and degraded situations;
- safety instructions;
- documents setting out the action to be taken in the event of an incident or accident.

The procedures are designed to be reversible, i.e. in such a way that at a number of key points during the activity it is possible to return to a situation where the system concerned is safe.

Procedures for conducting Risk activities shall be approved by the Safeguard entity of the Establishment and submitted to the President of the Centre national d'études spatiales for activities whose Risks extend beyond the scope of the Establishment.

Before a system is in Risk configuration, the Safeguard entity shall be informed of the configuration check and the correct operation of the system circuits.

The staff performing the operations must be fluent in the language in which the procedures are written and these procedures must be translated into at least French or English.

ARTICLE 40 – **MISSIONS AND RESOURCES OF THE SAFEGUARD ENTITY**

A Risk Activity may only commence after obtaining the agreement of the Safeguard entity of the Establishment concerned. To this end, this entity shall check that the resources and conditions necessary for safe conduct of the operation, such as fire protection resources, security, meteorological surveillance, alerting of medical resources, the presence on the premises of a representative of the Safeguard entity, the evacuation of a particular zone or compatibility with the activities carried out in parallel, have been met.

Each Safeguard entity must have the technical means necessary to supervise Risk activities and in particular:

- the video systems necessary to monitor activities on the CSG site;
- Means of communication to maintain links with the staff concerned and to ensure the collection and dissemination of information or alerts, in liaison with the President of the Centre national d'études spatiales.

Any representative of the Safeguard entity may attend activities in the field on their own initiative, in compliance with the safety studies drawn up within the framework of the applicable regulations.

ARTICLE 41 – **ANOMALIES, INCIDENTS OR ACCIDENTS**

For any anomalies, incidents or accidents occurring on a system or element at risk and any events with serious or catastrophic consequences occurring during the Risk activities, particularly during the campaign or in the launch chronology, any person referred to in Article R331-10 of the above-mentioned Research Code shall:

- take the necessary emergency measures, such as alerting the emergency resources and re-establishing the safety of the Facilities;
- ensure that these anomalies, incidents or accidents are immediately brought to the attention of their Safeguard entity;
- immediately bring these anomalies, incidents or accidents to the attention of the President of the Centre national d'études spatiales;
- ensure that these anomalies are the subject of a technical instruction enabling the causes to be identified and corrective actions to be defined.

Subsequent to the technical instruction mentioned above, the lessons learned in matters of Safeguard and the measures adopted shall be brought to the attention of the Safeguard entity and the President of the Centre national d'études spatiales.

ARTICLE 42 – **SAFETY BARRIERS**

Safety Barriers are required for Risk systems or circuits that may be activated in an untimely manner, either by hardware failure or by human error. The minimum number of these depends on the severity of the feared event:

- three barriers for an event with catastrophic consequences;
- two for an event with serious consequences.

For Risk systems or circuits, the component located on such a circuit or system that controls the passage of the signal (fluid, current or optical signal), is considered a barrier.

Barriers against the same feared event shall be independent and, if possible, different in nature. They may be mechanical, electrical, software or consist of procedures where physical barriers are technologically impossible.

Barrier implementation procedures shall be designed in such a way that multiple barriers in the same circuit or system are not lifted simultaneously.

ARTICLE 43 – **INTERCEPTS**

For circuits or systems whose Risks are catastrophic in nature within the meaning of Article 25 of this Order, the Safeguard entity of the Establishment concerned must have:

- firstly, control of one of the barriers or to prohibit the lifting thereof;
- secondly, the status report of the barrier concerned.

This resource is referred to as an 'Intercept'. It must not be technically surpassed. An absence of power to the circuits of an Intercept must not change the status of the system or circuit. Once the Intercept has been lifted and the command has been executed, restoring the Intercept to its original position must not have any effect on the circuit or system in question.

ARTICLE 44 – **PYROTECHNIC SYSTEMS**

1. The components of the pyrotechnic systems, as well as the pyrotechnic substances, if exposed during a Nominal activity or if the structure of the object containing them does not provide protection, are chosen according to their low sensitivity to external thermal (hot point, fire), mechanical (fall, shock, impact, friction, vibration), electrical (static electricity, lightning, electromagnetic emission) chemical (chemical compatibility) and optical aggressions.

For the execution of a function, the launch operator or the operator responsible for the site return or any entity responsible for the design or development of the launcher, or the industrial payload, shall ensure that it has chosen the pyrotechnic article or material presenting the least danger when subjected to an external aggression.

2. Any solid propellant engine constituting the propulsion system of a stage of the launcher shall be designed and implemented in such a way as to prevent any risk of uncontrolled flight for all phases of the life of the engine: production, storage, transport, testing, integration on the Launch vehicle, until no later than the launch chronology.

The on-board or ground-based anti-flight devices, shall preferentially be of Passive safety barrier type.

3. Electro-pyrotechnic initiators (igniters, primer-detonators) must provide a level of safety at least equivalent to those of type 1 A, 1 W, 5 min. no-fire.

4. In addition to the special rules for the design of electrical systems defined in Article 46 of this Order, the electrical circuits of pyrotechnic systems shall be designed in such a way as to limit the induced current on the firing circuit to at least 20 dB below the maximum no-fire current, when exposed to an electromagnetic field defined by the electromagnetic environment generated by the Ground resources, the launcher and the Payloads.

If the circuit includes a filter, it shall be mounted as close as possible to the initiator to be protected and the portion of the circuits located between the filter and the initiator shall be shielded.

The components shall be capable of withstanding, without ignition or degradation, a discharge of:

- 25 000 V supplied by a capacitor of 470 to 500 pF through a pure resistance of 5 000 Ω, the voltage being applied to the terminals of the component;
- 25 000 V supplied by a capacitor of 470 to 500 pF, without a resistance, the voltage being applied between the short-circuited terminals of the component and its housing.

The electrical power source for the circuits of pyrotechnic systems shall preferentially be a direct current source.

Otherwise, the power supply must comply with the electromagnetic compatibility requirements as defined in Article 48 of this Order.

6. The intensity delivered by the control equipment of the electro-pyrotechnic devices shall be such that there can be no untimely priming or Phlegmatisation of the initiator. The control intensity shall be limited to at least 20 dB below the maximum no-fire current.

7. The Safeguard entity of the Establishment shall ensure that the electrical control equipment is approved. A firing circuit shall not be capable of accumulating any electrostatic charge.

8. The electropyrotechnic components shall be in a safe configuration during storage, handling and after assembly, taking into account in particular the possibility of external aggression. They shall be connected only after it has been checked that no voltage is present.

9. The periods of radio silence are indicated in the procedures for conducting activities described in Article 39.

10. The setting up of the electro-detonators and/or the connection of the electro-pyrotechnic chains classified as 'Risk' must be carried out as late as possible in the launcher or Payload preparation sequence. As soon as they are connected, the Establishment's Safeguard entity must be able to have access to the status control of the pyrotechnic chains.

The pyrotechnic chains classified as 'Risk' must be made safe as early as possible in the operating sequence of the launcher after a Controlled re-entry on site to the CSG.

If returning to a barge, the pyrotechnic chains must be made safe no later than upon arrival at the port of Pariacabo, subject to a Safeguard submission guaranteeing an acceptable level of safety.

11. In addition to the provisions included in the safety data sheets for pyrotechnic articles and materials, the following is set out in detail:

- the classification in division of pyrotechnic Risk at work;
- the results of safety tests against the mechanical (shock, fall, friction, vibration), thermal (hot spot, fire), electrical (static electricity, electromagnetic emission, lightning), chemical (chemical compatibility) and optical aggressions to which the components of the pyrotechnic systems and the pyrotechnic materials under consideration might be

subjected during the course of all of their life stages at the CSG;

- The pyrotechnic effects expected in Nominal operating mode and in degraded mode when subjected to external aggression.

12. Pyrotechnic articles that have not been used or which have reached their use-by date shall be recovered by their owner and destroyed. The destruction procedure shall be submitted to the President of the Centre national d'études spatiales.

ARTICLE 45 – **SPECIAL CASE OF OPTOPYROTECHNIC IGNITION SYSTEMS**

1. Optopyrotechnic initiators must provide a level of safety at least equivalent to those of '135 mW in continuous mode' (5 min no-fire) type (optical power) or 0.78 mJ in impulse mode or 'no-fire' optical energy.

2. The optical power and energy supplied by the control equipment of optopyrotechnic devices shall be such that untimely priming or phlegmatisation of the initiator cannot occur. In the case of an ignition chain without a Safety barrier downstream of the controlled initiator, optical control power and energy are limited to at least 40 dB below the no-fire signal.

3. In the case of an ignition chain with a safety barrier downstream of the controlled initiator, optical control power and energy are limited to at least 20 dB below the no-fire signal.

4. The Establishment's Safeguard entity shall ensure that the optical control equipment is approved.

5. The optopyrotechnic components shall be in a safe configuration during storage, handling and after assembly, taking into account in particular the possibility of external aggressions.
Their connection shall be preceded by a check that there is no supply voltage to the laser source and that there are no other laser sources likely to conflict with the optical line.

6. The optical ignition equipment and the optopyrotechnic detonator must remain dissociated for as long as possible in the launcher or Payload preparation sequence (without taking barriers into account). As soon as they are connected, the Establishment's Safeguard entity must be able to have access to the status control of the optopyrotechnic chains.

ARTICLE 46 - **ELECTRICAL SYSTEMS**

1. Electrical systems, even if they comply with French regulations, are considered to be Risk systems, without limitation of voltage, current or frequency, when one of the following conditions is met:

- The electrical system activates systems or components containing one or more dangerous products;
- The electrical system may, in the event of failure(s), deliver energy (electrical, thermal, etc.) or effluents likely to cause direct damage (electrical, thermal effect) or indirect damage (effect on a Risk System connected to the electrical system).

2. Risk electrical systems shall be protected against overcurrents and transient overvoltages.

3. The equipment shall be designed so that external metal parts and shields can be earthed.

4. The following rules apply to cables:

- cables must withstand and be protected against abrasion and twisting;
- cables shall be selected on the basis of fire resistance, smoke generation and compatibility with surrounding

fluids;
- cable shields must not be used as earth conductors or signal lines (except coaxial cables for the latter case);
- the conductors of Risk electrical circuits must not be routed in the same cables or cable ducts as those used for other circuits;
- redundant links must run through different cables and ducts;
- structures must not have sharp edges in the areas where the cables are installed so as to avoid the risk of cable damage;
- the bending radius of the cables must be checked.

5. The following rules apply to the connectors of Risk systems:

- The connectors shall be designed in such a way that their connection is unambiguous (asymmetric connectors). Colour coding may be used but is no substitute for asymmetric connectors.
- The connectors shall be appropriately guided during plugging so that the female and male contacts are not subject to stress during coupling or uncoupling.
- The connectors shall be guided and restrained in such a way that they do not transmit any stresses to the contacts that might affect their correct operation.
- The connectors shall have female contacts on the power supply side and male contacts on the consumption side;
- The deterioration of a connection (crushing of the connector or contact between two adjacent pins) must not lead to a catastrophic or serious event;
- It must be possible to lock the connectors used for Risk circuits;
- The position of the pins must be such as to avoid any risk of short circuit between two pins or between one pin and the plug; the conductors of Risk circuits must have specific connectors and pin headers, which must not under any circumstances be common to other circuits.

6. The following rules apply to *batteries*:

- batteries must be able to be easily disconnected;
- if the battery is not connected, the connection terminals shall be provided with protection to prevent Risks of short circuit;
- In the event of a short circuit, all effects must be managed;
- Perform safety tests (voltage drop, overload, internal and external short circuit, etc.) and provide the corresponding results.

ARTICLE 47 – **STATIC ELECTRICITY**

1. Risk electrical systems as well as electrical systems contributing to the safety or continuing safety of Facilities shall be designed in such a way as to be insensitive to electrostatic discharge.

2. A material is deemed conductive in the electrostatic sense when its volume resistivity is less than 10^8 Ωm.

3. Systems in which static electricity may present a Risk with serious or catastrophic consequences within the meaning of Article 25 of this Order shall be designed and constructed in such a way as to limit the creation and accumulation of electrostatic charges through the use of conductive materials.

4. The fixed or mobile conductive elements (metallic or non-metallic) constituting these systems are interconnected by equipotential links and connected to earth. These links are subject to electrical checks.

5. During their implementation, the different elements of the Payload, the launcher and their respective associated equipment as well as the Ground facilities must not accumulate electrostatic charges during integration activities as well as during transfers.

6. Personal protective devices preventing the accumulation of electrostatic charges must be used when handling objects or explosive substances sensitive to electrostatic discharges. These protective devices may consist of conductive shoes or strips associated with a conductive floor, conductive bracelets or conductive work clothing.

They shall be made, used, maintained and checked according to established best practice.

ARTICLE 48 – **ELECTROMAGNETIC COMPATIBILITY (EMC)**

1. Launch vehicles or Space objects that have made a Controlled re-entry on site onto the ground, Payloads, Facilities and Ground resources shall be designed in such a way as to ensure electromagnetic compatibility between the various electrical Facilities and equipment.

2. Established best practice shall be observed, particularly in relation to:

- the establishment of meshed networks or interconnected earth planes connected to earth;
- equipotential links, with regard to high-frequency currents, electrical earths, metal earths of equipment, shields and screens;
- wiring and the routing of high and low current cables;
- the electrical continuity of the cable ducts and metal trunking, between the various chassis, at the wall passes and with the equipment served;
- the separation of disruptive high-current components from sensitive low-current components;
- electrical continuity and the continuation of shielding across cables/connectors, connectors/pin headers and connected pin headers/equipment.

The above provisions shall be implemented taking into account environmental constraints (corrosion in particular) and shall be checked when they are commissioned or, where appropriate, after undergoing a structural modification, and periodically thereafter.

ARTICLE 49 – **FLUID SYSTEMS**

1. A circuit containing one or more Dangerous fluids is considered to be a Risk system.

A circuit containing one or more fluids under pressure and complying with the French regulations for pressure equipment is considered to be a Risk system if at least one of the fluids is a dangerous fluid.

2. Risk circuits shall be designed in such a way that:

- mixtures of incompatible fluids are impossible;
- the connections are distinguished mechanically (connection, length) whenever there is a risk of fitting error or when the component is specific to a given fluid;
- The lubricants and materials used are compatible with the fluids concerned (chemical, thermal, mechanical aggression, etc.);
- Any retention is impossible, with the exception of elements whose function involves retention (filters, vapour traps, etc.).

3. Systems receiving Dangerous fluids must always undergo a leak test prior to filling, to at least the maximum Pressure expected in the presence of staff. For systems having undergone a Flight phase, this test must be performed prior to any Risk activity.

4. The components or equipment of the fluid systems to be checked before each campaign must be included in a revalidation plan.

5. All conductive parts, metallic or non-metallic, fixed or mobile, of the tanks, transfer circuits and associated organs

(valve, filter, etc.), shall be interconnected by equipotential links and connected to earth before and during any transfer of fluid.

ARTICLE 50 – **MECHANICAL AND ELECTROMECHANICAL SYSTEMS**

Mechanical and electromechanical systems used in Risk activities shall be subject to an Operational reliability study.

ARTICLE 51 – **CONFINED ATMOSPHERE**

1. Premises with a confined atmosphere must be identified with signage to that effect in accordance with labour legislation.

2. Staff having to enter a Confined atmosphere zone must take note of and apply the special safety instructions setting out the action to be taken to prevent the Risks of anoxia before being able to access the premises concerned, under the conditions defined in Article 11 of this Order.

3. All staff must be provided with a breathable air mask or an air-tight suit supplied with breathable air when entering premises that are difficult to evacuate. These premises shall be continuously ventilated and an external monitor shall be present throughout the duration of the activity.

4. Before staff enter a Confined atmosphere zone, the oxygen level is checked.

5. All work in a Confined atmosphere with a Suboxygenation risk requires the presence of at least two independent detectors, one of which must be fixed, each equipped with a low alarm, continuously monitoring the atmosphere. The low alarm level to be taken into account for detection shall be 19 % oxygen (percentage by volume).

6. In the particular case of Ground facilities, all with a Suboxygenation risk shall be equipped with a fixed oxygen level detection system equipped with a remote alarm as well as a local sound and light alarm.

7. Where people are required to enter normally inaccessible Confined atmosphere Facilities, the Safeguard entity shall conduct a safety analysis to take into account the above rules.

ARTICLE 52 – **BREATHABLE AIR CIRCUITS**

Breathable air circuits shall be designed so as not to be polluted. To this end, the mobile connectors and connections are mechanically distinguished (connections, lengths).

ARTICLE 53 – **TOXIC RISK ATMOSPHERE**

1. Premises or installations with Toxic-risk atmospheres shall be identified as such by means of signage.

2. Staff having to enter a Toxic-risk atmosphere zone must take note of and apply the special safety instructions setting out the action to be taken to prevent Risks of inhalation of toxic products before being able to access the premises concerned, under the conditions defined in Article 11 of this Order.

3. Any work in a Toxic-risk atmosphere zone requires the presence of a detector, equipped with an alarm, that constantly monitors the atmosphere.

4. In the particular case of Ground facilities, any premises with a Toxic-risk atmosphere shall be equipped with a fixed system for detecting toxic vapour/gas levels, equipped with an alarm designed in accordance with the provisions of Article 57 of this Order, as well as a local sound and light alarm.

5. For any activity involving a toxic fluid, toxicity measurements shall be taken before, during and after the activity.

6. All detectors shall be set so that the alarm is triggered when the concentration of a toxic substance in the workplace atmosphere exceeds 90 % of the Short-term limit value (STLV). If the STLV of a toxic substance has not been defined, the alarm is set to be triggered at 90 % of its 8 h **O**ccupational **E**xposure **L**imit value (OEL 8 h).

7. All staff must be provided with a mask with an appropriate filter cartridge for the various Risks considered, or an air-tight suit supplied with breathable air according to the Risks generated by the activity.

8. If work or activities require components that have contained toxic fluids to be opened to the air, they shall first be emptied and the workers shall be protected if the components have not been decontaminated.

9. Each voluntary discharge of toxic, liquid or gaseous effluents must obtain the agreement of the Establishment's Safeguard entity, which shall verify that this discharge is carried out in accordance with the legislation on facilities classified for environmental protection and pyrotechnic safety.

10. Restrictions on staff access to hazardous areas and the use of remote controls are defined according to the aggressiveness of the Dangerous fluids and the Risks that they generate.

ARTICLE 54 – **EXPLOSIVE ATMOSPHERE**

In the case of systems containing flammable and toxic fluids, the Facilities and equipment must not generate an explosive atmosphere around them in normal operation.

This requirement can be adapted for outdoor degassing.

ARTICLE 55 – **RADIONUCLIDES**

In addition to the provisions on the transport of dangerous goods laid down in Article 19 of this Order, any holder or user of radionuclides, within the meaning of the relevant provisions of the Public Health Code, in the form of a radioactive source, or of products or devices containing them, shall send the President of the Centre national d'études spatiales a copy of the authorisation files for possession and use, as well as the names and contact details of persons competent in radiation protection (PCR).

ARTICLE 56 – **LASER RADIATION SYSTEMS**

1. Any holder or user of laser radiation systems with a risk of serious or catastrophic consequences within the meaning of Article 25 of this Order shall send the President of the Centre national d'études spatiales the descriptive file of that device, including its classification and the associated Risks, as well as its location and configuration of use and storage.

2. In the case of an optopyrotechnic system, the following rules shall apply to optical harnesses:

- cables must withstand and be protected against abrasion and twisting;
- cables shall be selected on the basis of fire resistance, smoke generation and compatibility with surrounding fluids;
- redundant links must run through different cables and ducts;
- structures must not have sharp edges in the areas where the cables are installed so as to avoid the risk of cable damage;
- optical wiring best practice must be observed, such as not exceeding an appropriate bending radius and having no sharp angles or folds;
- the conductors of Risk circuits must have specific connectors and pin headers, which must not under any circumstances be common to other circuits.

3. The following rules apply to connectors of Risk laser radiation systems:

- The connectors shall be designed in such a way that their connection is unambiguous (asymmetric connectors). Colour coding may be used but is no substitute for asymmetric connectors.

- The connectors shall be appropriately guided during plugging so that the female and male contacts are not subject to stress during coupling or uncoupling.
- The connectors shall be guided and restrained in such a way that they do not transmit any stresses to the contacts that might affect their correct operation.
- It must be possible to lock the connectors used for Risk circuits.

CHAPTER V.2 SPECIFIC RULES FOR GROUND FACILITIES AND GROUND RESOURCES

ARTICLE 57 – **ALARM AND SECURITY SYSTEMS**

1. The alarm and safety systems shall be the subject of operational reliability studies justifying compliance with the requirements of Article 26 of this Order.

2. Their failure shall be signalled by an alarm.

3. In line with the Facility risk analysis, fixed detector safety alarms (fire, toxic gases and vapours) are referred to the Safeguard entity and to the CSG fire and rescue centres.

ARTICLE 58 – **ELECTRICAL SYSTEMS**

1. All electrical systems of ground equipment associated with launchers and Payloads must have an emergency power supply cut off enabling all active conductors to be cut off in a single operation.

2. Emergency cut-offs shall be easily accessible and easily recognisable.

3. Security systems shall be subject to a detailed analysis in order to identify the systems to be kept active in the event of an emergency cut-off.

4. Inside a room where a Risk activity takes place, emergency lighting shall be installed to ensure that the activity in progress can be conducted safely.

5. Battery storage and charging premises shall be adequately ventilated to ensure that the concentration of emitted vapours is below 25 % of the lower explosion limit (LEL). These rooms must be equipped with fixed detectors for measuring the concentration of vapours emitted and an associated alarm system(s), when the risk exists despite the measures put in place.

ARTICLE 59 - **ELECTROMAGNETIC COMPATIBILITY (EMC)**

Risk electrical systems and electrical systems contributing to the safety or continuing safety of the Facilities are insensitive to radiated electromagnetic emission (radar, lightning, radio communication, telephone) and emission conducted by the various high current, low current and other conductive networks (e.g. fluid).

ARTICLE 60 – **CIRCUITS CONTAINING DANGEROUS FLUIDS**

In addition to the general provisions laid down in Article 49, the following rules shall apply.

1. Remotely controlled circuits containing Dangerous fluids must have valves that automatically revert to the safety position (either open or closed) in the event of loss of energy (electrical, hydraulic, pneumatic, etc.).

2. Fluid circuits (cryotechnical, corrosive, flammable) that can damage electrical equipment are designed in such a way that a leak does not risk damaging the control-command power lines to the point of generating a Risk with serious or catastrophic consequences within the meaning of Article 25 of this Order.

3. Storage tanks for Dangerous fluids shall be fitted with valves isolating them from the distribution circuit, which can be operated under the maximum possible pressure and flow conditions per construction.

4. For mobile devices (particularly karts), the vents of valves and pressurisation components for toxic or flammable fluids are designed to be collected and connected to the vents of fixed Facilities.

ARTICLE 61 – **PROTECTION AGAINST LIGHTNING**

1. The provisions relating to lightning protection laid down in the legislation on installations classified for environmental protection apply to the Launch vehicle (including recovered stages) or the Re-entry vehicle in all its phases of implementation.

2. This lightning protection shall preferably be provided by means of passive protection and, failing that, by means of active protection. In the latter case, this protection is compatible with the weather forecasting and lightning protection capacities of the CNES/CSG.

CHAPTER V.3 GLOBAL RULES SPECIFIC TO LAUNCHERS, PAYLOADS AND RE-ENTRY VEHICLES

ARTICLE 62 – ON-BOARD ELECTRICAL SYSTEMS

1. An on-board electrical system is considered to be 'risk' if it can deliver a contact current able to cause electric shock and burns, with an intensity greater than or equal to:

- 3.5 mA for continuous and alternating currents up to a frequency of 10 kHz;
- 350*f mA (f being the frequency expressed in MHz) for alternating currents with a frequency varying from 10 kHz to 100 kHz;
- 35 mA for alternating currents with a frequency exceeding 100 kHz.

2. Prior to any transfer of the launcher or the Payload, the electrical circuits classified as 'Risk' shall be checked and kept safe throughout the duration of the transfer.

3. The umbilical links of the Risk electrical circuits are checked before connection.

ARTICLE 63 – RISK CLASSIFICATION CRITERIA FOR ON-BOARD FLUID SYSTEMS

On-board pressurised fluid systems are considered to be Risk systems if the dimensions and operating pressures of each of the separate components (container or pipework) are as follows:

Nature of fluid	Container (vessel)	Pipework
GASES or liquids whose vapour pressure at the maximum permissible temperature is 0.5 bar higher than normal atmospheric pressure.	P > 0.5 bar and V > 1 L and PxV > 50 bar x L or P > 1 000 bar	P > 0.5 bar and DN > 32 mm and PxDN > 1 000 bar x mm
GASES or liquids whose vapour pressure at the maximum permissible temperature is less than or equal to 0.5 bar higher than normal atmospheric pressure.	P > 10 bar and PxV > 10 000 bar x L or P > 1 000 bar	P > 10 bar and DN > 200 mm and PxDN > 5 000 bar x mm

V: internal volume of the container in litres
P: gauge pressure, in bar
DN: Nominal diameter in mm – Numerical designation of the dimension common to all elements of a pipework system other than those elements designated by their external diameter or thread size. This is a rounded number for reference purposes and does not strictly reflect manufacturing dimensions. The Nominal size is indicated by DN followed by a number

It is clarified that components are considered distinct when the rupture of one cannot propagate into the other

ARTICLE 64 – ON-BOARD PRESSURISED FLUID SYSTEMS CLASSIFIED AS 'RISK'

On-board pressurised fluid systems classified as 'Risk' within the meaning of Articles 49 and 63 of this Order shall comply with a recognised standard or at least with the requirements set out in Article 44 of this Order and the rules set out below.

1. The pressure vessels of on-board fluid systems are designed for pressure loads with a Burst safety factor Jr of at least 2. In certain special cases this coefficient may be lowered to 1.5, depending on the possible failure modes demonstrated by studies and tests.

An LBB-type pressure vessel used within the pressure range required to obtain the LBB characteristics only generates a danger zone because of the possible leakage of the fluid it contains. In this case, only the hazard associated with this fluid is taken into account in determining the Hazard zone.

Vessels must undergo a programme of tests and trials in order to confirm their correct sizing and the quality of their execution.

2. The pressurised on-board fluid systems and their components shall have undergone the following Stamping tests prior to their arrival within the CSG perimeter:

A stamping coefficient Jt is defined such that the stamping pressure is achieved at Jt times the maximum pressure reached in the presence of staff.

If the Burst safety factor Jr is greater than or equal to 2, Jt = 1.5. If the Burst safety factor Jr is less than 2, Jt = $\frac{1+Jr}{2}$

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In the event of it being demonstrably impossible to carry out this Stamping test on the whole system, due to the design, tests may be carried out in parts. The final assembly of the entire system is subject to appropriate quality provisions to ensure the mechanical strength of the assembly during pressurisation. Any accepted deviation from the applicable quality procedures shall be justified and brought to the attention of the President of the Centre national d'études spatiales.

3. The Stamping test configuration must not undergo any technical development or incident that could affect its validity.

After testing the system, the Maximum expected operating pressure must never be exceeded.

Pressure vessels in use must not have been subjected to any aggression (mechanical, thermal, electrical, etc.) liable to affect their characteristics.

In the case of repair or maintenance, a representative leak test is required before any recommissioning. In addition, if the activity is not limited to disassembly/reassembly but includes more significant interventions (welding, forming, etc.), the pressure system shall be inspected and tested.

4. Pressurisation and depressurisation speeds must not create uncontrollable dangerous situations (temperature gradient, water hammer, etc.).

The relative pressure in millibar exerted on a component that has been operated on manually (dismantling, repair, tightening or loosening of fittings, etc.) shall be such that the product of this pressure and the internal cross-section of the component (expressed in cm^2) is less than 1 000.

Any assembly of elements containing a fluid under pressure shall be of 'Safe-Life' type, as defined in Article 1 of this Order.

In the particular case of a system assembled by welding, the welds between these different parts are checked after assembly by a non-destructive process recognised in the field of aerospace. Any discrepancies found during these inspections shall be brought to the attention of the President of the Centre national d'études spatiales.

5. During the dynamic pressurisation or depressurisation phases and in the static phase, operational constraints are set by reference to the instantaneous safety factor Js, defined as the ratio between the permissible burst pressure and the relative pressure reached at the instant in question by the system in question:

Js = Permissible burst pressure/Instantaneous relative pressure considered. This variable factor Js is also such that Js is greater than or equal to Jr.

Access to danger zones generated by a pressurised on-board fluid system (of a launch vehicle, including recovered stages, or a vehicle that has re-entered the site) is subject to the following special rules:

Safety factor Js	Access in static phase	Access in dynamic phase[1]
Js ≥ 4	No constraint	No constraint
3 ≤ Js < 4	No constraint	Access controlled[2]
2[4] ≤ Js < 3	Access controlled[2]	Access restricted[3]
Js < 2[4]	Access prohibited	Access prohibited

[1] : The dynamic phase includes fluid movements and the handling of pressure vessels, but excludes the steps to be observed for temperature balancing following pressurisation.

[2] : Only people directly concerned with the activities and for which their presence is indispensable are admitted. These activities may concern elements other than the vessel in question.

[3] : Only persons concerned with the pressurisation/depressurisation activity are admitted if the activity cannot be carried out remotely.

[4] : In the particular case of LBB type under pressure, the limit is 1.5.

6. For on-board pressurised fluid systems, classified 'Risk', returning to Earth, after a flight phase, the pressure values of the tanks and circuits must be made available by the operator responsible for the return of the object and monitored in real time by the Safeguard entity of the operating Establishment comprising the CSG landing site.

ARTICLE 65 – **PYROTECHNIC SYSTEMS**

1. 'Mechanical safety barriers' refers to safety and armament boxes (BSA) for electropyrotechnical systems, optical safety boxes for optopyrotechnical systems (BOS) and mechanical barriers integrated into the detonator.

2. The following shall be equipotential and earthed: extraneous conductive parts (metallic or non-metallic) and the shielding of components in a pyrotechnic chain, an initiator, a mechanical safety barrier, transmission and distribution components and functional devices (destruction bars, cutting cords, rockets, valves, hydraulic cylinders, etc.).

3. For pyrotechnic systems presenting a Risk with catastrophic consequences within the meaning of Article 25 of this Order, the barrier in the vicinity of the source of the Risk must consist of a mechanical barrier that must prevent untimely ignition of the system.

4. Mechanical barriers shall be constructed in such a way that:

- the barrier, once positioned in either the 'armed' or 'unarmed' state, cannot leave that position without a command or under the effect of external stress (shocks, vibrations, electrostatic phenomena) in a normal or accidental environment;
- the barrier is intercepted in accordance with the provisions of Article 43 of this Order;
- the position status report is representative of the actual 'armed' or 'unarmed' state and can be acted on remotely;
- the 'armed' or 'unarmed' state is shown on an indicator;
- they are controlled remotely but manual disarmament is always possible or an intrinsic device can be used to return them to a safe state;
- in the context of a mechanical barrier not integrated into the detonator, it is physically impossible to fit the detonator or the optical connection if the housing is not in the 'disarmed' position;
- in the context of a mechanical barrier integrated into the detonator, a dedicated device enables the state of the barrier to be known when fitting.

5. The placement of the detonators or the optical connection shall allow easy access for fitting and connecting the detonators or optical connection, and manual disarming if the mechanical barrier is not integrated.

6. The mechanical barriers are in safety position in the presence of staff. It must be possible to check this safety position in order to establish the status of the system.

PART VI. IN-FLIGHT SAFEGUARD RULES

The provisions of PART VI apply only to Launch vehicles without stage return unless explicitly applicable to the return of stages and/or Re-entry vehicles. The diversity of the latter may indeed imply specific Safeguard requirements, which will be explained on a case-by-case basis during phase 0 submission of the system.

CHAPTER VI.1 GENERAL RULES

ARTICLE 66 – DEFINITION AND DELIMITATION OF ZONES AND LINES AND ASSOCIATED MEASURES

1. Definition and delimitation of Zones and lines

Three geographical zones are defined for the Safeguard and Intervention Mission (MSI) defined in Article 69 of this Order in the event of a Nominal and accidental situation in flight.

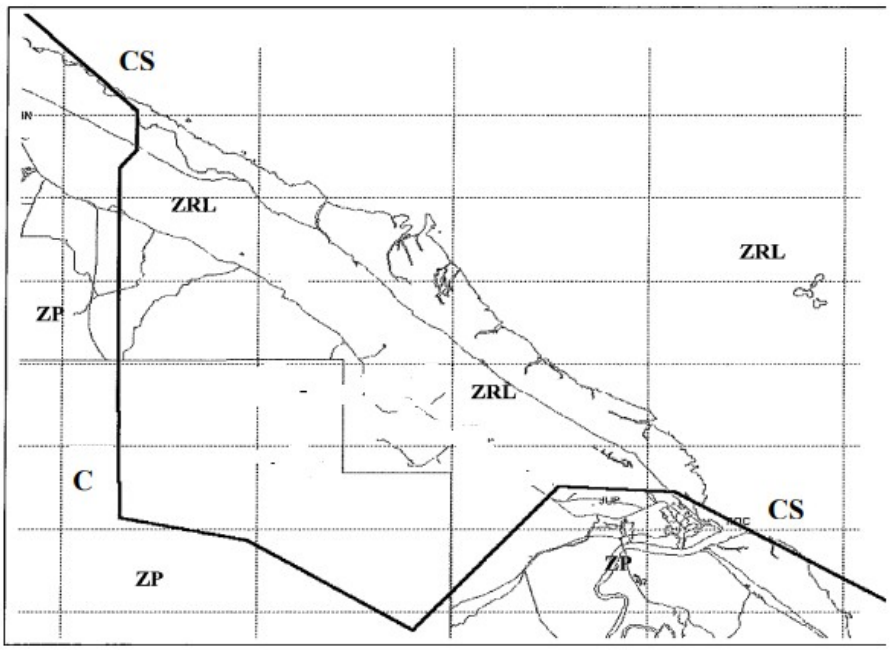
Launch risk zone (ZRL): The launch risk zone is defined as a land and sea area within which the flight of a Launch vehicle or the return of a stage, in a Nominal or accidental situation, may give rise to catastrophic or serious risks within the meaning of Article 25 of this Order, whether of a mechanical, thermal or toxic nature.

Protected zone (ZP): land and sea complement to the Launch risk zone (ZRL). The Protected zone includes the lands of Guyana but more broadly all the lands protected by measures for the benefit of the MSI.

Moderate risk zones (ZRM): One or more ZRMs are defined as geographical zones included in the ZRL. The level of protection and the perimeter of the ZRM(s) are defined specifically for each Launch System by Regulatory Instruction of the President of the Centre national d'études spatiales.

Safeguard line (SC): The safeguard line is the border between the ZP and the ZRL. Beyond this limit, exposure of the public in the ZP to Risks as defined in Article 25 of this Order is considered to be negligible. Specific management is set out in Article 66.3, concerning the impact of light fragments affected by the wind. The geographical coordinates of the points defining the Safeguard line are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

Impact limit (LI): The impact limit complements the Safeguard line to define a Moderate risk zone. The geographical coordinates of the points defining the LI are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.



CS

C

ZP

ZRL

CS

C

ZP

ZRL

2. Measures in relation to the ZRL

The terrestrial part of the Launch risk zone is evacuated by the President of the Centre national d'études spatiales at the time of the launch chronology and for any on-site stage returns, without prejudice to the measures that the Prefect may take, in particular under the aforementioned Decree No 89-314 of 16 May 1989. However, some buildings dimensioned to withstand all of the feared effects may house the strictly necessary staff.

3. Measures in relation to the ZP

In the event of failure of the Launch vehicle or a return stage, the latter shall be neutralised so that the risks with catastrophic or serious consequences in the Protected Area, within the meaning of Article 25 of this Order, whether mechanical, thermal or toxic, are considered negligible.

The negligible nature of the Risk is ensured by:

- the qualitative and quantitative measures imposed on the Safeguard system in Articles 63 to 85;
- increasing assessment of zones affected by toxic, thermal and mechanical harm, these areas being excluded from the ZP.

A probabilistic approach for Mechanical risks associated with light fragments in the presence of wind is possible when compatible with the safety of people and property and protection of the environment and public health. In this case, the categorisation of light fragments, as well as the Risk thresholds associated with the probabilistic approach, are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

4. Measures in relation to the ZRMs

The levels of protection of the ZRMs are specified by Regulatory Instruction of the President of the Centre national d'études spatiales.

In such areas, the presence of people may be subject to the existence of special measures ensuring, in particular, protection against the toxic effects incurred or against falling fragments.

In the event of serious danger, the President of the Centre national d'études spatiales may, however, have this area evacuated in accordance with the provisions of Article 16 of this Order.

ARTICLE 67 – **PROVISION OF FLIGHT CORRIDOR**

The Flight Corridor, as well as the method used to obtain it, shall be provided to the President of the Centre national d'études spatiales by the launch operator.

ARTICLE 68 – **CONTRIBUTION TO ESTABLISHMENT OF THE FREE-FLIGHT DOMAIN**

All data necessary for establishment of the Free-flight domain shall be transmitted to the President of the Centre national d'études spatiales.

ARTICLE 69 – SAFEGUARD AND INTERVENTION MISSION (MSI)

1. General Principles

As part of their Safeguard mission in relation to space operations, the president of the Centre national d'études spatiales carries out what is known as a Safeguard and Intervention Mission (MSI) implementing a Safeguard system making it possible at any time:

- to assess the hazardous nature of the launch vehicle in flight, or of its return stages, or of the Re-entry vehicle;
- to intervene if necessary to neutralise the Launch vehicle or the return stage, or to interrupt the operation of the Re-entry vehicle, without the impact area resulting from this Neutralisation interfering with foreign land or territorial waters and knowing the reaction of the intervention device;
- to know the status of the resources involved in this task.

2. Duration of the MSI

The Safeguard and Intervention Mission of a Launch vehicle begins when it leaves the ground and ends no later than when its impact area touches the territorial sea of the first State encountered outside French Guiana. The effective end of the MSI shall be determined on the basis of the hazard study and decided by the President of the National Centre for Spatial Studies.

In the case of a Controlled re-entry on site of a stage, orbited or not, or a Re-entry vehicle, the MSI shall start at the earliest as soon as its impact area no longer touches the territorial sea of a State outside French Guiana and shall end no later than the moment of first physical contact between the object and the landing platform. The effective start and end of the MSI shall be determined on the basis of the hazard study and decided by the President of the Centre national d'études spatiales

3. Interruption of the flight during the MSI

The flight of any Launch vehicle, return stage and Re-entry vehicle must be able to be interrupted from the ground by the President of the Centre national d'études spatiales during exercise of the Safeguard and Intervention Mission before the flight conditions no longer ensure the safety of people and property and the protection of public health and the environment.

To this end, the Launch vehicle must have an on-board Safeguard system compatible with the CNES/CSG Safeguard resources and complying with the requirements of this Order. The neutralisation decision and its implementation are the responsibility of the President of the Centre national d'études spatiales.

In accordance with Article 36 of this Order, the launch operator shall send the President of the Centre national d'études spatiales all necessary data, in particular that provided for in Articles 16 to 19 of the Technical Regulation, enabling preparation and implementation of the intervention resources.

In accordance with Article 36 of this Order, the Re-entry vehicle operator shall send the President of the Centre national d'études spatiales all necessary data enabling preparation and implementation of the intervention resources.

4. FS/FS criterion

For the treatment of cases of Risks with catastrophic consequences within the meaning of Article 25 of this Order, the FS/FS criterion applies in the following way: the first Failure being the failure of the Launch vehicle, a Safeguard system Failure must therefore not lead to a Risk with catastrophic consequences. This implies, inter alia, that the set of Ground and edge resources involved in the application of the Safeguard measures must comply with the 'Fail Operational' (FO) criterion. However, in the case of Neutralisation on the basis of predictive intervention criteria as defined in Article 71 of this Order, the launch operator must comply as far as possible with the FO criterion.

Zone des trajectoires soumises aux mesures de la MSI — Trajectory zone subject to MSI measurements

ARTICLE 70 - MONITORING AND ALERT MISSION (MSA)

1. General Principles

The President of the Centre national d'études spatiales carries out what is known as a **M**ission of **S**urveillance and **A**lerte (MSA) implementing a Safeguard system enabling:

- ensure flight tracking of the Launch vehicle launched from the CSG, a return stage, or the Re-entry vehicle carrying out a Controlled re-entry on site, in order to check that the operation goes smoothly and the Nominal impact zones of separated elements;
- in the event of failure of the Launch vehicle launched from the CSG, of a return stage, or of the Re-entry vehicle carrying out a Controlled re-entry on site, to transmit to the competent authorities the information relating to the impact zone for these elements, making it possible to organise rescue operations in French Guiana or to notify the authorities of the States concerned as soon as possible. This information shall also be transmitted to the operator.

2. Duration of the MSA

The monitoring and alert mission starts when the Launch vehicle leaves the ground and ends with completion of the Shut-down phase of the last stage of the launcher.

When the Shut-down phase leads to an immediate Controlled re-entry in zone or on site, the monitoring and alert mission shall continue until the impact zone evaluation or immobilisation of the object on the site.

In the case of a stage performing a controlled re-entry after an orbital phase or in the case of a re-entry vehicle performing a re-entry on site, the start of the MSA shall be determined on a case-by-case basis.

ARTICLE 71 – **REQUIREMENTS SPECIFIC TO MSI**

The launch operator shall send the President of the Centre national d'études spatiales all necessary data for the establishment of intervention criteria and in particular that provided for in Articles 16 to 19 of the Technical Regulation.

The operator of the Re-entry vehicle shall send the President of the Centre national d'études spatiales all data necessary for the establishment of intervention criteria.

Predictive intervention criteria (CIP) may be implemented by the President of the Centre national d'études spatiales from the ground, in particular on the basis of studies carried out under Article 18 of the Technical Regulation, in order to neutralise the Launch vehicle before its impact area touches the territorial sea of the first State encountered outside French Guiana.

The analysis of physically realistic diverted trajectories whose occurrence could not have been sufficiently mitigated by barriers or risk-reducing measures, makes it possible to consolidate the Free-flight domain beyond which Neutralisation of the Launch vehicle is ensured in the interests of the safety of people and property and the protection of public health and the environment.

When planning the trajectory and attitude of the launch vehicle, stage return or Re-entry vehicle, the operator must optimise the on-board/ground connection balances (telemetry, remote control, location).

CHAPTER VI.2 NEUTRALISATION SYSTEM

ARTICLE 72 – REQUIREMENTS REGARDING THE NEUTRALISATION SYSTEM

The Neutralisation system includes an on-board device that triggers Automatic neutralisation in the event of rupture of the Launch vehicle.

The launch operator must ensure that the On-board safeguard system is compatible with CNES/CSG Safeguard resources.

In the case of a Launch vehicle comprising one or more reusable elements, each stage for which a Controlled re-entry on site is planned and for which an MSI phase has been decided in accordance with Article 69.1, must also have its own deactivation system.

ARTICLE 73 – EFFECTS OF THE NEUTRALISATION SYSTEM

The main objective of the Neutralization system is to meet the provisions of Articles 66.1 to 66.4 of this Order.

In order to do so, activation of the Neutralisation system, from a single command, must lead to:
- the instant and permanent termination of thrust of the active stage;
- inhibit the ignition of any stage capable of propulsion;
- prevent any self-propulsion of each stage capable of such a mode of operation.

In order to minimise the thermal, toxic and mechanical impacts of all or part of the Launch vehicle or return stage falling to the ground, it is recommended that activation of the Neutralisation system be able to:
- ensure the direct or indirect dispersion of toxic propellants, with or without combustion;
- avoid the detonation of solid or liquid propellants whether at altitude or upon potential impact with the ground;

In all cases where these recommendations cannot be complied with, the launching operator must provide the President of the Centre national d'études spatiales with supporting evidence to ensure compliance with the constraints associated with the zones to be protected and minimisation of the environmental impact.

ARTICLE 74 – FUNCTIONS OF THE NEUTRALISATION SYSTEM

Functions of the Neutralisation system

The launch operator shall ensure that the Neutralisation system can perform the following functions:
- **Controlled neutralisation:** a Neutralisation command, issued from the ground, actuates the Neutralisation function. During its implementation, no process of the On-board function shall be able to inhibit or delay the execution of this function.

- **Instantaneous automatic neutralisation**: an automatic device on board instantly executes the Whole Launch vehicle neutralisation function in the event of non-nominal separation or stage burst. This function may also be a risk reduction measure with regard to the loss of the On-board safeguard system.

- **Delayed automatic neutralisation:** in the case of Neutralisation by destruction, an on-board automatic device executes the function with a specified delay to neutralise a stage for which no Controlled re-entry on site is planned, after Nominal separation and before impact with the ground.

- **Inhibition of the on-board remote control receiver device:** this on-board remote control receiver device is inhibited at the end of MSI.

ARTICLE 75 – DESIGN OF THE NEUTRALISATION SYSTEM

The launch operator shall ensure that the elements of the Neutralisation system under its responsibility meet the following criteria:

- Single failure tolerance (FO) through Redundancy and Geographical segregation within the physical boundaries of the Launch vehicle. The fact that a common mode cannot be ruled out must not undermine the Overall safety objective;
- The levels of reliability relating to the Delay failure must be consistent with the Overall safety objective. They will be set in the feasibility phase of the Safeguard submission process and approved via a Regulatory Instruction;
- Independence of the On-board function.

In the event that this is impossible, and duly documented as such, any link (dialogue bus, electrical earth, sequential order, etc.) between the equipment carrying out Neutralisation Safeguard functions and the equipment of the On-board function must not delay or inhibit the capacities of the Neutralisation functions.

ARTICLE 76 – ELEMENTS OF THE NEUTRALISATION SYSTEM

The following components of the Neutralisation system are subject to the submission process as defined in Article 36 of this Order:

- actuator components enabling action to be taken on the Launch vehicle (Safeguard pyrotechnic chain, valves, etc.);
- control devices, which may be either an on-board receiver of a signal emitted by the ground or a specific on-board device;
- energy supplies to these components;
- power and communication circuits.

Neutralisation systems are designed to withstand attacks that may be encountered during the launch chronology, the Launch Phase and any site-return phases.

In the event of it being impossible to comply with the Segregation rule laid down in Article 75, for certain existing systems as well as for new systems, an Operational security study must demonstrate compliance with the safety objectives as laid down in Article 27 of this Order.

When Neutralisation is triggered, the system must be able to function under the most severe environmental conditions that may result from the failure of the Launch vehicle or the return stage.

ARTICLE 77 – IMPLEMENTATION OF NEUTRALISATION SYSTEMS IN LAUNCH VEHICLES

The launch operator shall provide the President of the National Centre for Spatial Studies with the information necessary to take into account and verify all of the effects of an in-flight accident of the Launch vehicle, whether as a result of failure of the Launch vehicle or the use of the Neutralisation system.

To this end, the launch operator shall provide:
- neutralisation scenarios (explosion, intact re-entry, rupture, etc.);
- physical characteristics at the limits of the Launch vehicle enabling its deviation to be modelled;
- fragmentation and explosion data;
- impact energies;
- aerodynamic data of all or part of the falling Launch vehicle;
- the shielding data and configuration and calibration data for the models used;
- the settings of the on-board Neutralisation algorithms for the auto-Neutralisation part if this function exists.

ARTICLE 78 – GENERATION OF NEUTRALISATION COMMANDS

The elements of the neutralisation system must be capable of handling the following three commands:
- maintain;
- controlled neutralisation;
- inhibition (or OFF).

The launch operator provides evidence that the Neutralisation systems are capable of performing the functions associated with each of these commands, in accordance with the procedures laid down in Article 36 of this Order.

ARTICLE 79 – PROCESSING OF NEUTRALISATION COMMANDS

On board, commands are received simultaneously by two on-board receivers authorised by the President of the Centre national d'études spatiales, which control two Neutralisation systems.

The theoretical time limit for processing, receiving and executing the Neutralisation system shall be submitted to the President of the Centre national d'études spatiales during the design phase as provided for in Article 36 of this Order.

For each flight, the launch operator measures the actual turnaround time for processing, receiving and executing the Neutralisation system during campaign activities and verifies its compliance with the theoretical turnaround time. The launch operator sends this information to the President of the Centre national d'études spatiales as soon as possible and, at the latest, before transfer to the launch area.

ARTICLE 80 – LIMIT OF VISIBILITY OF THE NEUTRALISATION REMOTE CONTROL (TCN)

During the entire MSI phase, the TCN link balance for command transmission is defined by:
- the geometric visibility limit set in such a way as to protect against the rapid drop in gain observed at the end of radio visibility at the moment of passing below the horizon and any radio-related disturbances;
- the range limit, taking into account radio propagation losses and the corresponding margins, which depends on the distance between the ground remote control station and the Launch vehicle, as well as the antenna network used;
- the actual reception at each remote control receiver of the Launch vehicle along the Nominal trajectory during MSI.

The values characterising the limit of geometric visibility, range and the reception level of remote control receivers are defined by Regulatory Instruction of the President of the National Centre for Spatial Studies.

ARTICLE 81 – **QUALIFICATION AND INSPECTION OF LAUNCH VEHICLES**

The elements of the Launch vehicle contributing to the Neutralisation, each subassembly as well as the complete device with its components (wiring, sockets, connections, etc.) are qualified taking into account the ambient conditions representative of the failure of the Launch vehicle.

The launch operator shall demonstrate this qualification by dedicated dimensioning tests and/or by a 'robustness' analysis of the neutralisation system based on Redundancy, Geographical segregation or specific protections. The robustness analysis must make it possible to demonstrate that the Safeguard chain remains FO (Fail Operational – functional and tolerant to a Failure) in the event of failure of the Launch vehicle. The demonstration may be based on an operator-specific or standardised approach.

The launch operator must also demonstrate that the equipment functions correctly after integration of the Launch vehicle, by means of tests. The specifications relating to all these tests shall be submitted to the President of the Centre national d'études spatiales under the conditions provided for in Article 36 of this Order.

CHAPTER VI.3 LOCATION SYSTEM

ARTICLE 81 – ELEMENTS OF THE LOCATION SYSTEM

The ground and on-board components of the system enabling the Launch vehicle or re-entry vehicle to be located and the potential impact zone determined shall be submitted by the operator responsible for them to the President of the Centre national d'études spatiales under the conditions laid down in Article 36 of this Order during their design and implementation phase.

Ground and on-board equipment contributing to the location function shall be compatible with the CNES/CSG Safeguard resources. The launch operator shall provide the President of the Centre national d'études spatiales with the necessary elements to enable them to ensure this compatibility.

To perform the MSI, the President of the Centre national d'études spatiales must have access to the flight location information at all times. The availability of this information must be ensured after the combination of two independent failures (compliance with the FS/FS criterion), one impacting the On-board function and leading to a catastrophic or serious Risk without intervention, the other concerning a location chain used for the benefit of the Safeguard.

In order to perform the MSA, the president of the Centre national d'études spatiales must have the Launch vehicle location information under the conditions provided for in Article 88 of this Order.

In the case of a Launch vehicle a part of whose elements perform a Controlled re-entry on site, the latter must have their own location system (adapted to the needs of MSI or MSA according to the Safeguard missions decided for these elements pursuant to Article 69.1) subject to the requirements of this CHAPTER.

A Re-entry vehicle performing a Controlled re-entry at the CSG site must also have its own location system.

ARTICLE 82 – DESIGN OF THE LAUNCH VEHICLE LOCATION SYSTEM

The launch operator shall ensure that the elements of the location system under its responsibility meet the following criteria:

- The location function used in the context of MSI must be resilient to any failure of the On-board function in order to ensure compliance with the FS/FS criterion. This need must be ensured by the provision of at least two location chains independent of each other and independent of the On-board function;
- Geographical separation of the equipment must be ensured within the physical limits of the vehicle;
- The fact that a common mode cannot be ruled out must not undermine the Overall safety objective;
- The reliability levels of the location system relating to the Delay failure must be consistent with the Overall safety objective and will be set from the 'feasibility – design' phase of the Safeguard submission process and approved by means of a regulatory instruction relating to the Launch vehicle;
- The ground and on-board processing of location data by the launch operator must not lead to its alteration;
- Any location chain shall be designed so that it is possible to determine the location of the Launch Vehicle at any time during the flight, in a Nominal, Dispersed or Degraded situation.

ARTICLE 83 – VIEWING OF THE LAUNCH VEHICLE

The launch operator shall make images available to the President of the Centre national d'études spatiales that allow real-time observation of the behaviour of the Launch vehicle. These images shall be compatible with those of the

CNES/CSG Safeguard and shall, as a minimum, be capable of characterising abnormal launch, take-off or landing behaviour of the Launch vehicle, as long as the location function cannot be fully provided by the other resources.

ARTICLE 84 – **PERFORMANCE OF LOCATION RESOURCES**

The launch operator, or any person responsible for the design or development of the Launch vehicle or Re-entry vehicle, shall provide the President of the Centre national d'études spatiales with the following elements, for each means contributing to a chain of location of the Launch vehicle or re-entry vehicle:

- the frequency of data provision
- the location precision
- the various deadlines and time frames for the data
- the data integrity performance
- the data continuity performance.

The requirements for these elements are quantified in a Regulatory Instruction of the President of the Centre national d'études spatiales. In particular, the RI specifies what is expected when the operator is not the master of the entire location chain.

The operator must provide a statement of the internal controls implemented for the on-board resources.

These supplies are defined during the Safeguard submission process, as provided for in Article 36 of this Order.

ARTICLE 85 – **QUALIFICATION AND CHECKS OF LAUNCH VEHICLES**

The elements of the Launch Vehicle contributing to the location, each subassembly as well as the complete device with its components (wiring, sockets, connections, etc.) are qualified taking into account the ambient conditions representative of the failure of the Launch Vehicle.

The launch operator shall demonstrate this qualification by dedicated dimensioning tests, and/or by a 'robustness' analysis of the location system based on Redundancy, Geographical segregation or specific protections. The robustness analysis must make it possible to demonstrate that the Safeguard chain remains FO (Fail Operational – functional and tolerant to a Failure) in the event of failure of the Launch vehicle. The demonstration may be based on an operator-specific or standardised approach.

Where a telemetry system transmits location information within the meaning of CHAPTER VI.3, the requirements of this Article shall apply to it.

The launch operator must also demonstrate that the equipment functions correctly after integration of the launcher, by means of tests. The specifications relating to all these tests shall be submitted to the President of the Centre national d'études spatiales under the conditions laid down in Article 36 of this Order.

CHAPTER VI.4 TELEMETRY SYSTEM

ARTICLE 86 – OBJECTIVES AND REQUIREMENTS FOR THE TELEMETRY SYSTEM

The launch operator shall transmit telemetry data to the President of the Centre national d'études spatiales that make it possible to:

- characterise the status of the ground to on-board remote control link, before take-off and in flight;
- assess the status of the On-Board Safeguard System, prior to take-off and in flight;
- receive the on-board acquisition report of remote-controlled orders;
- monitor the status of on-board automation relating to the Safeguard function, including deorbiting and passivation functions;
- acquire the parameters enabling implementation of the Predictive intervention criteria, if provided for;
- acquire the location of the Launch vehicle;
- receive the correct operating status of the Launch Vehicle (propulsion, flight control, electrical equipment).

The on-board telemetry transmission resources must be compatible with the CNES/CSG Safeguard resources.

In the case of a Launch vehicle a part of whose elements perform a Controlled re-entry on site, the latter must have their own telemetry system, subject to the requirements of this CHAPTER. A Re-entry vehicle performing a Controlled re-entry at the CSG site must also have its own telemetry system.

ARTICLE 87 – USE OF TELEMETRY FOR A LAUNCH VEHICLE MSI

At all times during the flight, the President of the Centre national d'études spatiales must have the following at their disposal in real time, for the purposes of carrying out their Safeguard and Intervention Mission as provided for in Article 69 of this Order:

- detailed location data;
- the status of the On-board Safeguard system;
- flight sequence data;
- on-board data relating to the operation of the Launch vehicle.

The launch operator shall send the President of the Centre national d'études spatiales the elements enabling definition of the detailed data necessary for the MSI, as well as the associated latencies. This data is the subject of a Regulatory Instruction from the President of the Centre national d'études spatiales for each Launch System considered.

ARTICLE 88 – USE OF TELEMETRY FOR A LAUNCH VEHICLE MSA

The launch operator must make available to the President of the Centre national d'études spatiales the following real-time parameters, for the purpose of exercising its **M**mission of **S**urveillance and **A**lerte as provided for in Article 70 of this Order:

- detailed location data;
- flight sequence data;
- on-board data relating to the operation of the Launch vehicle.

This provision must cover the entire Nominal flight domain of the Launch vehicle and, as far as possible, the deviated trajectories.

In the event of difficulty in application due to the needs of the mission, telemetry holes may be allowed, under certain conditions, in the following phases, as of the end of the MSI:

- ballistic phases;

- non-propelled orbital flight phases including attitude control manoeuvres;
- propelled non-significant orbit change phases in orbital phase;
- Payload separation phases.

No telemetry hole is acceptable during the stages: separation of stages, propelled orbital change that may in the event of a failure induce a risk of re-entry, propelled phase of deorbiting, and initial conditions prior to controlled atmospheric re-entry of the components of the launch vehicle (including the passivation sequence).

The conditions necessary for the acceptance of telemetry holes are:

- justification by the launch operator of the impossibility of covering the phase in question, accompanied by an analysis of the associated risks;
- installation of an on-board recording;
- a telemetry hole duration that is compatible with the guarantee of acquisition by the next station in all non-nominal cases (excluding explosion during the telemetry hole phase).

The implementation of measures permitting acceptance of the telemetry holes shall be submitted by the launch operator to the President of the Centre national d'études spatiales.

The launch operator must send the President of the Centre national d'études spatiales the elements enabling definition of the detailed data necessary for the MSA, as well as the associated latencies. This data is the subject of a Regulatory Instruction from the President of the Centre national d'études spatiales for each Launch System considered.

ARTICLE 89 – **COMPATIBILITY WITH THE CSG TELEMETRY SYSTEM**

In the event that the launch operator, or any person responsible for the design or development of the launcher or the Re-entry vehicle, provides the resources and input data necessary to create the network of specific stations, these resources shall be the subject of the Safeguard submission provided for in Article 36 of this Order.

The resources used on board during launch, stage return or Controlled re-entry on site shall be compatible with the CNES/CSG Safeguard resources.

ARTICLE 90 – **QUALIFICATIONS AND TESTS OF THE LAUNCH VEHICLE**

The telemetric elements of the launcher, each sub-assembly as well as the complete device with its constituents (wiring, sockets, connections, etc.) are qualified. The launch operator must demonstrate this qualification through dedicated testing.

Where a telemetry system transmits location information within the meaning of CHAPTER VI.3, the requirements of Article 85 shall apply to it.

The launch operator must also demonstrate that the equipment functions correctly after integration of the launcher, by means of tests.

The specifications relating to all these tests shall be submitted to the President of the Centre national d'études spatiales under the conditions laid down in Article 36 of this Order.

ARTICLE 91 – **EXPLOITATION OF FLIGHT DATA**

The operator must carry out a systematic post-flight analysis of the data transmitted by the Launch vehicle, the return stage or the Re-entry vehicle concerning the systems contributing to the Safeguard.

A summary of these operations shall be sent in writing to the President of the Centre national d'études spatiales. This summary shall include, as a minimum, any anomalies encountered that might have an impact on the Safeguard, as well as the envisaged treatment of those anomalies.

PART VII. CONDITIONS FOR PROCEEDING WITH THE LAUNCH OR STAGE RETURN – FINAL CHRONOLOGY

ARTICLE 92 – **NECESSARY CONDITIONS FOR LAUNCH**

Pursuant to Article R331-11 of the Research Code, the President of the Centre national d'études spatiales shall decide on the launch chronology if any of the criteria set out in Articles 93 and 94 of this Order is not met.

ARTICLE 93 – **METEOROLOGICAL CRITERIA**

Ground wind

The launch operator shall provide the quantities and types of propellants used, so that the ground wind criterion may be defined in order to ensure the safety of people and property and the protection of public health and the environment.
The ground wind criterion is established as the maximum permissible wind level at which the threshold for toxic effects defined by the Safeguard line is not passed.

Wind at altitude

For each launch or stage return, simulations, taking into account the vertical wind profile closest to H0, shall be carried out by the President of the Centre national d'études spatiales in order to estimate the risk beyond the Safeguard line, for light fragments subject to wind, in accordance with Article 66 of this Order.

Lightning

The applicable criteria associated with the Risk of lightning strike of the Launch vehicle or stage return are as follows:

- C1: No lightning Risk within a radius of 10 km from the Launch vehicle;
- C2: No convective clouds whose apex exceeds 6 500 m altitude within a radius of 10 km around the launch site at H0;
- C3: No cumulonimbus anvil above the launch site if the storm cell is less than 20 km away.

ARTICLE 93 – **TECHNICAL CRITERIA**

Flight Safeguard function

Launch shall be subject to the status of the on-board Safeguard system, correct operation of the ground control devices and the status of any deorbiting devices, in order to ensure that the Launch vehicle or return stage is 'locatable, neutralisable and has functional telemetric systems' under the conditions laid down in PART VI of this Order.

The last check of the correct operation of the Neutralisation, location and telemetry systems shall be carried out in a configuration as close as possible to that of the flight and as late as possible in the launch chronology.

Authorisation and measures of the Minister for Space

Launch is subject to the existence and maintenance of the authorisation to proceed with the launch issued by the Minister responsible for space under the above-mentioned Law on space operations.

Application of the provisions of this Order is without prejudice to the implementation by the Minister or, by delegation, the President of the Centre national d'études spatiales, of the instructions and measures necessary in the interest of the safety of people and property and the protection of public health and the environment, as provided for in Article 8 of the aforementioned Law on Space Operations and Article L331-7 of the Research Code.

Collision in orbit

In the context of their Safeguard mission in relation to space operations, the President of the Centre national d'études spatiales shall ensure the protection of inhabited Space objects. To this end, the envisaged launch window must be compatible with the position of inhabited Space objects whose orbital parameters are precisely known and available.

Evacuation of launch and stage return Risk zones

In accordance with the provisions of Article 66 of this Order, the ZRL is evacuated in the launch chronology and during the possible phase of controlled Re-entry of stages on site. Only people required for the launch (or Controlled re-entry on site) and in ZRM, those under the control of the President of the Centre national d'études spatiales are permitted to remain in certain reinforced buildings of the ZRL.

ARTICLE 94 – **EXTERNAL PROTECTION OF THE CSG**

The President of the Centre national d'étude spatiales may also order the launch chronology at the request of the representative of the State responsible for external protection, under the conditions laid down in the aforementioned Decree of 16 May 1989.

PART VIII. PENALTIES

ARTICLE 95 – **ADMINISTRATIVE FINE**

In accordance with Article R331-12 of the Research Code, the President of the National Centre for Spatial Studies may impose a fixed administrative fine in respect of class 5 offences against any natural or legal person referred to in Article R331-10 of that Code carrying out an activity in breach of the provisions of this Order.

PART IX. ADMINISTRATIVE PROVISIONS

ARTICLE 96 – **COMMUNICATION OF INFORMATION, DATA AND FILES**

All information, data and files needing to be sent or submitted to the President of the Centre national d'études spatiales in the context of application of the provisions of this Order shall be addressed to the Director of the CSG.

ARTICLE 97 – **APPEALS**

This Order may be appealed before the administrative court with territorial jurisdiction by the applicant within two months of its notification.

Within the same two-month period, the applicant may lodge an informal appeal. More than 2 months of silence from the President of the Centre national d'études spatiales in response to a request for an internal appeal shall be understood as an implicit decision rejecting this request in accordance with Article R421-2 of the Code of Administrative Justice.

PART X. GUIDE TO BEST PRACTICE

ARTICLE 98 – **GUIDE TO BEST PRACTICE**

A Guide to best practice shall be drawn up by the President of the Centre national d'études spatiales in order to characterise certain practices in force that contribute to demonstrating compliance with this Order.

This Guide is based on practices validated through experience gained in the preparation and execution of space operations carried out at the Guianese Space Centre and in the operation of the Facilities located there. It is based in particular on norms, technical specifications for normative purposes and standards recognised by the profession, notably in relation to the safety of property, people, public health and the environment.

Use of the Guide to best practice should not be mandatory or exclusive in nature.

PART XI. FINAL PROVISIONS

ARTICLE 99 – **FINAL PROVISIONS**

This Order repeals the Order of 9 December 2010 governing the operation of the Facilities of the Guiana Space Centre.

The provisions of this Order apply to activities carried out within or from the perimeter of the CSG as of its publication in the compendium of administrative acts of the Prefecture of Guiana.

This Order may be freely consulted at the badge handover room of the Guiana Space Centre.

The President of the Centre national d'études spatiales shall be responsible for the implementation of this Order.

Done in Paris, on xx/xx/xxxx