



CENTRE NATIONAL D'ÉTUDES SPATIALES

# Technical Regulations for space operations

A tool box to  
protect people, goods, public health and  
the environment



*Treaty on Principles Governing the Activities of States  
in the Exploration and Use of Outer Space, including  
the Moon and Other Celestial Bodies*



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## Why a Space Law and technical regulations?

### ■ Main objectives :

- ◆ Safety
- ◆ Public health
- ◆ Environmental protection
- ◆ Space debris mitigation



**Long Term Sustainability  
of Space Activities**

- **Consider international guidelines and standards**
- **Identify realistic ways of compliance with regulations**
- **Consult stakeholders early during rulemaking process**
- **Define appropriate interim provisions: Time and money are needed to adapt space systems to reach full compliance.**



## Some basis for rulemaking process

### ■ COPUOS :

- ◆ Principles for the use of Nuclear Power Sources in Outer Space
- ◆ Space debris mitigation guidelines of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space
- ◆ ...and future results of Working Group on the Long-term Sustainability of Outer Space Activities

### ■ ISO :

- ◆ 24113 Standard “Space debris mitigation” was an important step in the harmonization process
- ◆ Writing of some new important standard ISO (Prevention of break-up of unmanned spacecraft for example) is on going

### ■ IADC:

- ◆ IADC mitigations guidelines and
- ◆ Support to the IADC Space Debris Mitigation Guidelines

### ■ IAASS :

- ◆ On going works on Launch and Re-entry Safety

### ■ COSPAR :

- ◆ Planetary protection policy

## How it works ?

- The operator shall draft and submit an authorisation demand file to the authority.
- Authorisation file shall demonstrate the compliance of space systems and procedures to be carried out by the applicant with **“Technical regulations”**.
- Once the authorisation is granted by the authority... supervision of the operator to ensure that **“Technical regulations”** are fulfilled

## Principle of prior authorization for:

- any operator, irrespective of nationality, intending to launch or bring back to Earth a space object on **French territory**.
- any **French operator** intending to launch or bring back to Earth a space object
- any person of French nationality intending to launch a space object
- any French operator intending to control such an object in space

## Conditions for get authorizations

- The applicant must supply moral, financial and professional guarantees.
- The systems and processes implemented must comply with technical regulations.

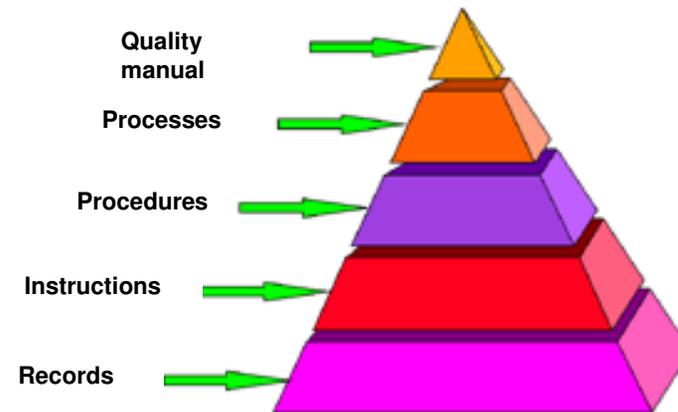
## Supervision to ensure that prescriptions are fulfilled

CNES is mandated by the law to ensure that systems and procedures implemented by space operators comply with technical regulations”

## Safety measures

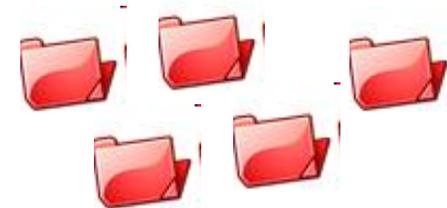
The Minister and the President of CNES are empowered to take **all necessary measures** to ensure the safety of people, property, public health and the environment

## ■ “Quality System” requirements



## ■ Technical dossier content

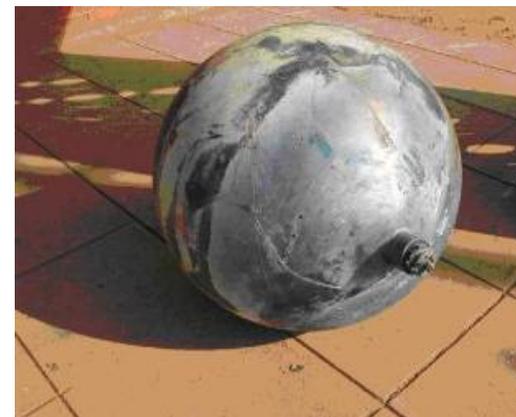
- ◆ Description of the operation,
- ◆ Hazard analysis
- ◆ Impact studies
- ◆ Risk mitigation measures
- ◆ Demonstration of compliance with requirements



- ◆ **“Worst case”** approach in near field
- ◆ **Collective risk for people (maximum acceptable probability):**  
 $\leq 2 \cdot 10^{-5}$  / **operation in far field**
- ◆ **Nominal impact zones** **outside landmasses** and territorial waters
- ◆ **Information to** the air and maritime traffic authorities about impact zones for transmission of appropriate notifications
- ◆ **Criteria for launch collision avoidance** with manned vehicles



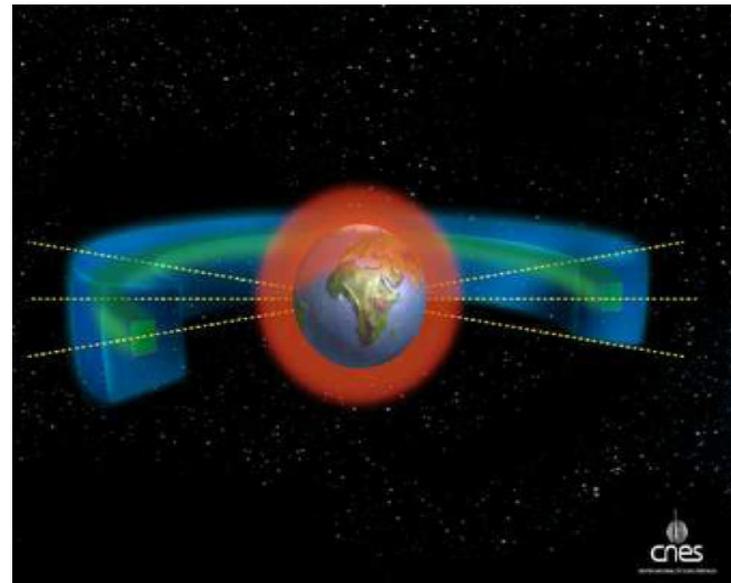
- ◆ Collective risk for the population (maximum acceptable probability):  
 **$\leq 2 \cdot 10^{-5}$ /operation**
  - ◆ Nominal impact zones **outside landmasses** and territorial waters
  - ◆ Information to the air and maritime traffic authorities about impact zones for transmission of appropriate notifications
- 
- ◆ In the event of fully justified impossibility of proceeding with controlled atmospheric re-entry, the operator must make its best efforts to respect a quantitative objective of  **$10^{-4}$** .



- **Protection of public health and the environment**
  - ◆ Mitigating risk of dangerous contamination during launch or re-entry (qualitative analysis for impact of combustions gases, ozone layer depletion, sea pollution, nuclear material)
- **Planetary protection**
  - ◆ Avoid harmful contamination and adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter



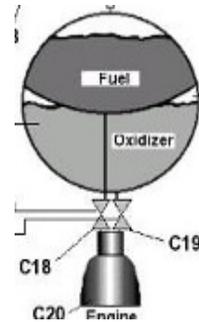
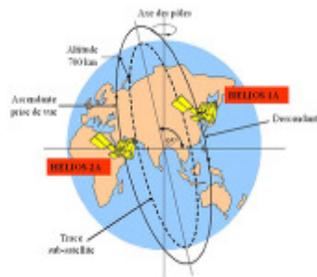
- ◆ Do not generate debris during nominal operations
- ◆ Minimise the probability of accidental break up
- ◆ Prevent collisions with satellites whose orbital parameters are known
- ◆ Remove space vehicles and orbital stages from protected regions after the end of the mission
- ◆ Live spacecraft in passive condition after the end of mission



# Appropriate expertise and competencies are needed to verify compliance with regulations

## Satellite

- System architecture
- Command and control
- Space dynamics
- Operations



## Launcher

- Limits of evolution of the launcher
- Demonstration of reliability
- Mechanical characterisation of ruptures



## Quality and Safety management

*Risks management, hazards analysis, environment study, reliability, operational feedback.*



## **Ethics Charter for inspectors**

- ◆ **Impartial opinions, giving no grounds for criticism**
- ◆ **Independent evaluation concerning the design and implementation of the process**
- ◆ **Transparency regarding the authority and operators**
- ◆ **Insure confidentiality of information**
- ◆ **Professional secrecy**
- ◆ **Full control of internal and external communication**

### ■ Why?

- ◆ **Make reachable debris mitigation objectives**
- ◆ **Define common public risk limits applicable both for domestic and international populations**
- ◆ **Keep the competition fair between commercial Space Operators**
- ◆ **Balance between safety, environment protection and cost at a global level**

