



# Space sustainability: a perspective from a French satellite operator

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*Technical Presentation*

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# Introduction

# Introduction to Eutelsat Group

Originally set up in 1977 as an intergovernmental organisation (IGO) to develop and operate a satellite-based telecommunications infrastructure for Europe.

First satellite launched in 1983.

IGO operations and activities transferred to Eutelsat S.A., a private company, in July 2001.

Eutelsat Communications is the holding company of the Group since April 2005.

In 2023, Eutelsat merged with the UK-based Oneweb LEO constellation to form Eutelsat Group.

Eutelsat Group's in-orbit resources comprise capacity on 36 satellites positioned in the geostationary arc and 634 in the LEO orbit, making Eutelsat Group the first LEO-GEO operator in the world and the largest fleet in Europe.

Executive member of the Space Data Association (SDA).

The sustainable use of space is the second of the core tenets of Eutelsat's CSR strategy.

*NB: Eutelsat Group's Oneweb LEO satellites are also subject to a comprehensive framework governed by two pieces of primary legislation in the UK (namely, the UK Outer Space Act 1986 and the Space Industry Act 2018) which will not be addressed under the present technical presentation.*



# Eutelsat practice on long-term sustainability: Space Debris Mitigation Overview

# Eutelsat Space Debris Mitigation Plan (1/2)

## Before 2005 Eutelsat was already acting as a responsible operator:

- Satellites controlled within their designated orbit control windows.
- Orbit relocations guarantying not entering into the SK box of other satellites.
- Avoiding/minimising debris generation during nominal operations.
- 3-sigma propellant budget with allocation of propellant for re-orbitation in line with international recommendations.
- Passivating satellites following re-orbitation as part of the decommissioning activities.

## An internal Space Debris Policy in place since 2005 to:

- Respond to the requirements from the FCC to support our USA clients and from our ISO 9001 certification in operations.
- Set a common baseline for our decommissioning activities.
- Establish a process to improve our end-of-life disposal operations.
- Minimise the risk of collisions and debris generation.

# Eutelsat Space Debris Mitigation Plan (2/2)

*Eutelsat Space Debris policy covers all phases - from satellite separation to station-keeping maneuvers, repositioning of satellite in orbit, anomaly remedial measures, strategies for operations in inclined orbit as well as end-of-life operations.*

**This Plan is aligned with the international** (issued by the Inter-Agency Space Debris Coordination Committee and the Committee on the Peaceful Uses of Outer Space) **and European guidelines** (European Code of Conduct for Space Debris Mitigation), **and with the criteria defined by the French Space Operations Act.**

## The general principles are:

- Limit the amount of debris released in a planned manner.
- Minimise the probability of the satellites becoming a source of debris.
- Control of satellites within their allocated orbital windows by standard routine periodic orbit correction manoeuvres.
- Avoidance of RF interferences.
- Allocate propellant for re-orbitation to 300 km above GEO height.
- Passivate satellite at end of life.

**These requirements are more stringent than those contained in the regulations applicable to the Company and the Plan is updated on a regular basis to incorporate the new standards.**

# The 2008 French Space Operations Act

# The French Space Operations Act

Adopted on 4 June 2008, but entered into force on 10 December 2010.

FSOA is the direct result of France's international obligations, deriving from UN treaties including:

- *the 1967 Treaty on principles governing the activities of States in the exploration and use of outer space, including the moon and other celestial bodies; and*
- *the 1972 Convention on international liability for damage caused by space objects*

The application decree relating to authorisations was published on 10 June 2009.

The technical regulation was published by decree on 31 May 2011.

The Act created a national regime of authorization and supervision of national space activities:

- The launch of a space object from France
- The procurement of a launch from France or abroad (French operators)
- The control of a space object in outer space (French operators)
- The transfer of a space object that has already been authorised

The Act also creates a licensing regime for operators involving certain guarantees and requires insurance (or another financial guarantee) throughout the space operation.

The operator may benefit from a State guarantee

- *If, as a result of an operation authorised under this Act, any operator is required to compensate a third party for damage caused by a space object during and/or after launch*
- *and for amounts exceeding the ceiling set out in the authorisation*

The screenshot shows the Légifrance website interface. At the top, it displays the French Republic logo and the text 'RÉPUBLIQUE FRANÇAISE' and 'Liberté Égalité Fraternité'. The main header includes 'Légifrance' and 'DROIT NATIONAL EN VIGUEUR'. Below this, there are navigation tabs for 'CONSTITUTION', 'CODES', 'TEXTES CONSOLIDÉS', 'JURISPRUDENCE', and 'CIRCULAIRES ET INSTRUCTION'. The main content area shows the title of the law: 'LOI n° 2008-518 du 3 juin 2008 relative aux opérations spatiales (1)'. Below the title, there is a search bar and a list of related documents, including 'JORF n°0129 du 4 juin 2008' and 'Accéder à la version initiale'.



# Authorisations and licences held by Eutelsat

*Non-exhaustive list*



## Control of space objects in-orbit

**4 December 2019: 10-year licence for control of space objects based on the Spacebus Néo platform of Thales Alenia Space**

**30 July 2021: 10-year licence for control of space objects based on the Eurostar Néo platform of Airbus Defence and Space**

*Applicable to the entire fleet (in-orbit satellites + satellites to be launched with certain existing platforms). Satellites with other platforms are subject to the case-by-case authorisation regime.*



## Launch Procurement

### Case-by-case authorisations

*One month before the launch, Eutelsat has to provide the launch authorisation obtained by the launch service provider.*



## Administrative licence

**1<sup>st</sup> December 2020: 10-year licence certifying Eutelsat's moral, financial and professional guarantees**

*Grants Eutelsat an exemption from the administrative part of such subsequent requests and reduces the authorisation timeframe (from 4 months to 1 month)*

# The Technical Regulation (space debris)

*Systems and procedures implemented by the operator in the frame of the operation shall be compliant with the national Technical Regulation.*

In particular, Art. 40 of the Technical Regulation concerns Space Debris Limitation and requires to:

- Justify that the **systems are designed, produced and implemented so as to avoid generating debris** during nominal operations
- Calculate and **provide the probability of occurrence of accidental break-up**
  - *must be less than  $10^{-3}$  until the end of life of the space object*
- Present the feasibility, with associated strategies, of:
  - *permanently depleting or placing all the on-board energy reserves in such a condition that they entail no risk of generating debris*
  - *permanently deactivating all the means for producing energy on-board*
- Present the **plan to leave the protected regions** once the space object has completed its operational phase
- Justify the **probability of having sufficient energy resources to successfully carry out the disposal manoeuvres**
  - *must be at least 0.9*
- Calculate and provide the **probability of being able to successfully carry out the disposal manoeuvres**
  - *does not include the availability of energy resources, must be made for the total duration of the operation and take account of all systems, subsystems and equipment usable for these manoeuvres*

# The Technical Regulation (space debris)

*Other obligations related to the generation of space debris:*

Provide a study of the potential hazards of the planned space operation for individuals, property, the environment and public health, and in particular hazards related to the generation of space debris

- production of space debris following an explosion, collision with a manned space object or a satellite in geostationary orbit, etc.

Provide an assessment, for nominal operations, of the impact of the planned operation on the Earth's environment and the impact in terms of generation of space debris.

Provide the prevention plan concerning the risks of accidental collision

- with manned objects and satellites in geostationary orbit for which the orbital parameters are precisely known and available.



# Organisation and Control

*Authorisations and licences are delivered by the Ministry in charge of space affairs, on the basis of a technical assessment carried out by the French space agency (CNES)*

## Control before the delivery of the authorisation

- *CNES is in charge of controlling the compliance of the planned space operation with the Technical Regulations > reviews the documentation provided by the applicant and the organisation set up to implement the planned operation*

## Control after the delivery of the authorisation

- *Technical reviews are scheduled by the operator prior to the launch and the disposal manoeuvres > CNES is invited and can review if the provisions of the Technical Regulation are correctly implemented*
- *The operator must inform the CNES without delay of any technical or organisational events that may affect the conditions of the space operation as authorised, in particular the disposal strategy*
- *The operator is required to notify the Ministry and the CNES of any changes in orbital position one month before the start of its implementation, except in the event of an emergency*

Through this process, France can certify that French space operators are compliant with ambitious stringent rules in terms of space debris mitigation.

# The FSOA – a living instrument bolstered by an inclusive process

*A revision of the 2008 FSOA and its associated regulation is currently led by the French authorities and almost complete.*

The revision responds to the need to adapt the regulatory framework to the fast-paced development of space activities:

- Increased space traffic - overcome the risk related to debris in orbit, limit debris generation through preventive measures;
- Provide a regulatory framework for new innovative activities (e.g., On-orbit servicing);
- Emergence of « Space Traffic Management » concept.

The revision was conducted in close coordination with French Operators/Industrial partners and includes:

- the new definition of constellations & mega-constellations
- the adaptation of the probability of successfully completing the disposal maneuvers,
- the application of new requirements for in-orbit services,
- the issue of the qualified duration for the satellite systems.

The updated Technical Regulation will include interim provisions, given the implications in terms of methods and design of some of the new obligations.

# Conclusion

- The aim of the French Space Law is to enable French industry/operators to protect outer space to maximise its use.
- In 2010, the **best practices implemented by Eutelsat** were already in line with the provisions with immediate effect of the technical regulation.
- The inclusion of interim provisions is necessary to give time to the industry/operators to adapt their designs/processes.
- It is paramount to involve satellites operators/industry when developing regulations to **enable pragmatic decision-making on space sustainability**, by taking stock of operator's experience.
- In the future, we do hope to see more open forums like the Space Sustainability Conference organized by Portugal and UNOOSA as a way to **foster a multistakeholder, multilateral, multidisciplinary approach**.

A similar approach followed by all countries/operators/industry would ensure that space debris limitation rules are systematically respected



# Thank you for your attention !

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