

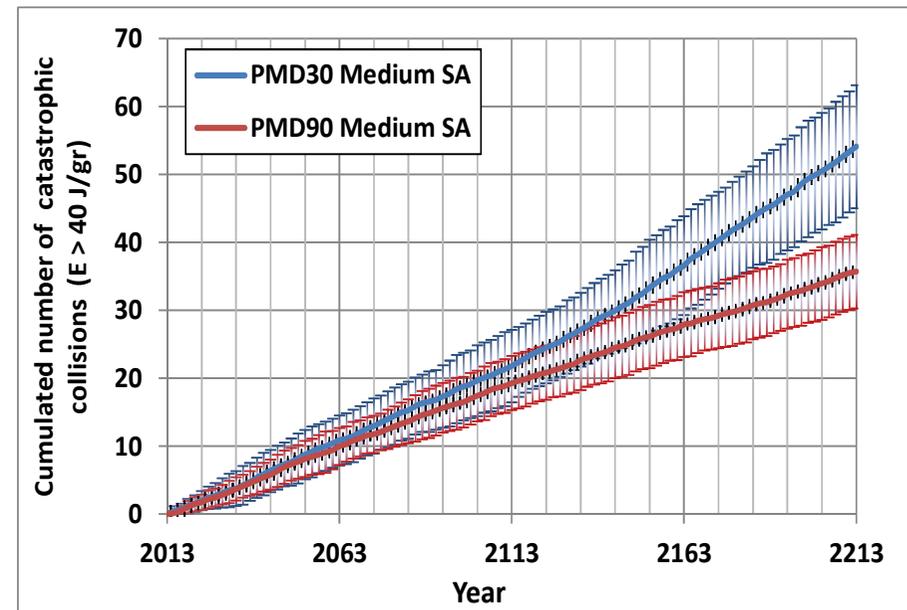
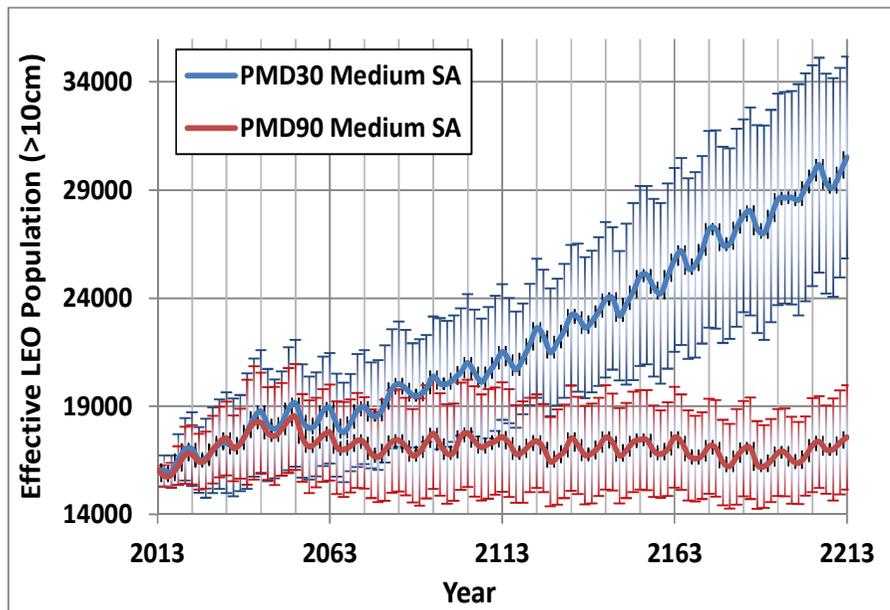
# **OVERVIEW ON 2015 SPACE DEBRIS ACTIVITIES IN FRANCE**

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**COPUOS STSC  
15-26 February 2016**

# MAIN STUDIES : Space debris population evolution with debris mitigation rules compliance analysis

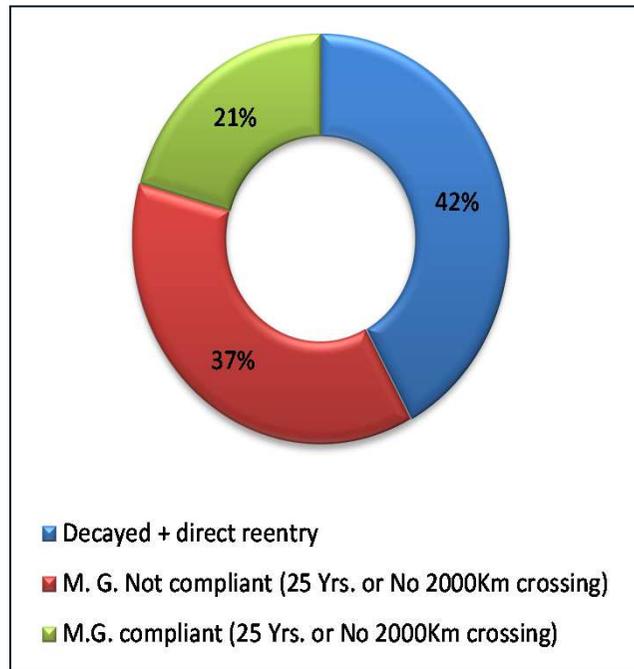
- Use of MEDEE (Modeling the Evolution of Debris on Earth's Environment ) to analyze the long term evolution of the space debris population (typically 200 years) with the following hypothesis :
  - ◆ Reproduction of the past launch rate,
  - ◆ Solar activity : medium,
  - ◆ Probability to perform the post mission disposal in accordance with the mitigations guidelines (PMD) of 90% and 30%.



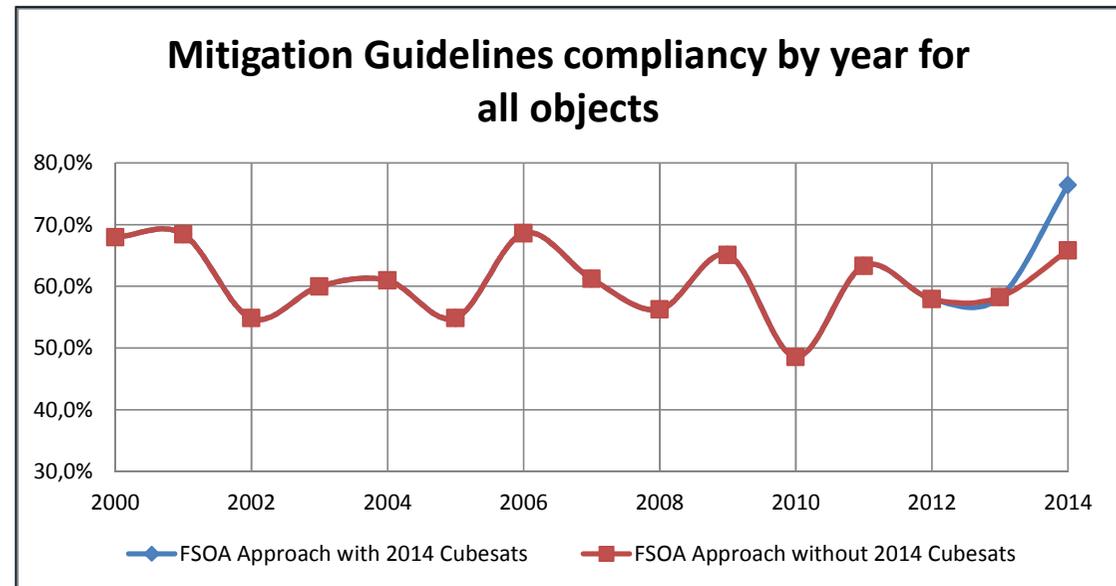
- The probability to perform the post mission disposal is a key parameter for long term sustainability and it should be as high as possible

# MAIN STUDIES : Debris mitigation rules compliance results

- Analysis of the results of the past (2000 to 2014) in Low Earth Orbit for post mission disposal of launchers and satellites



Global statistics for all objects between 2000 - 2014

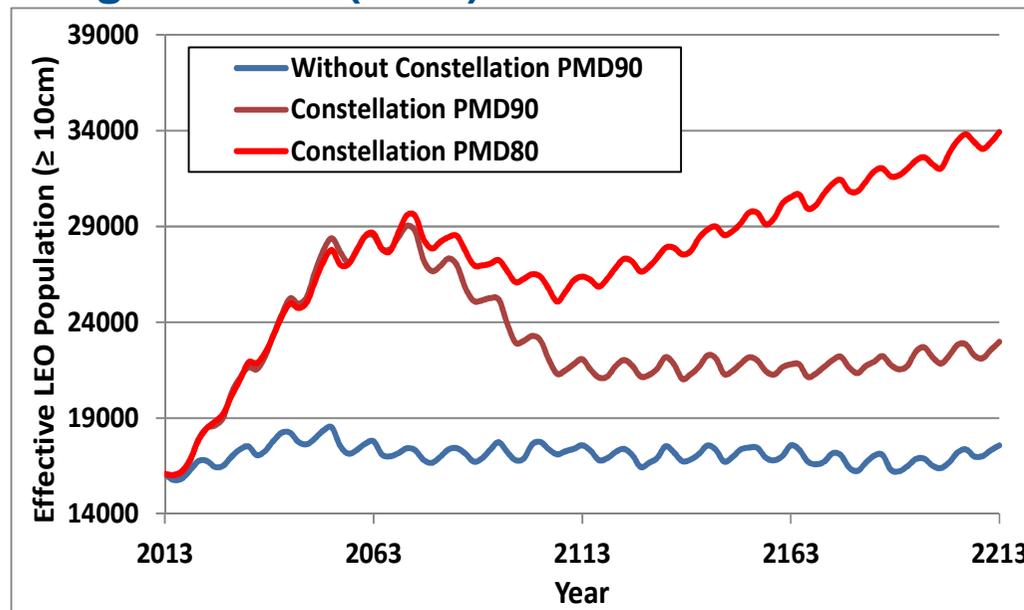


Yearly statistics for all objects between 2000 - 2014

- For post mission disposal, the compliance with the mitigations guidelines is around 63% without significant improvement.

# MAIN STUDIES : Space debris population evolution with a constellation

- Use of MEDEE with the following hypothesis :
  - ◆ Reproduction of the past with a post mission disposal rate of 90 %,
  - ◆ Addition of a constellation of 1080 satellites with an orbit altitude of 1100 km and inclination of 85°
  - ◆ Probability to perform the post mission disposal in accordance with the mitigations guidelines (PMD) of 90% and 80% for the constellation



- Du to the number of satellites, and depending on the probability to perform the post mission disposal in accordance with the mitigations guidelines, a constellation could be a major challenge for long term sustainability.

# OPERATIONAL ACTIVITIES : collision risk monitoring



## CAESAR (Conjunction Analysis and Evaluation, Assessment and Recommendations)

	LEO 2014	LEO 2015	MEO 2015 (LEOP GALILEO)	GEO 2015
Satellites monitored	16	14	3	8
Conjunction messages handled	~ 165 500	~ 140 000	16	~ 30 000
Close approach analyzed	-	~ 19 000	14	~ 14 000
Additional tracking request	12	10	0	0
Effective collision avoidance maneuvers	17	21	0	0

# REGULATORY ACTIVITIES (French Space Act)

- **Authorization given in 2015:**
  - ◆ **Jason 3 (CNES),**
  - ◆ **EUTELSAT 8 WEST B,**
  
- **Conformance status for ESA : IXV**
  
- **End of life**
  - ◆ **EUTELSAT 16B (Final orbit 561 km above geostationary orbit, passivation)**
  - ◆ **CNES : SPOT 5 (Final orbit 809 x 625 km, passivation)**
  - ◆ **ESA : ATV-5 controlled re-entry**



# NATIONAL REGISTER OF SPACE OBJECTS

## French registered objects launched in 2015

- **1 satellite:**

Date	Name	Launcher	Launch base
August 20	EUTELSAT 8 WEST B	Ariane 5	Kourou

- **6 Ariane 5 upper stages**
- **6 Sylva**
- **3 Fregat (upper stage of Soyouz)**
- **2 Avum (upper stage of Vega)**