

**7th Workshop on Satellites
End of Life
CNES Headquarters
January 25, 2018**



The objectives of this 1-day workshop are:

- **to inform the satellites operators on the existing guidelines and their evolutions,**
- **to exchange information about recent operations (reorbiting or deorbiting maneuvers, passivation)**
- **to get feedback in order to identify implementation difficulties and possible evolutions of the guidelines**

2018 Spring Meeting in Paris



AGENDA

10h00-12h30	Morning session
10h00-10h05	Introduction, (Philippe Marchal –Deputy Director Cnes Toulouse CNES)
10h05-10h15	Workshop presentation (Pierre Omaly-CNES)
10h15-10h25	Complete overview of past adherence to the IADC space debris mitigation guidelines and trending (Lemmens, S.-ESA)
10h25-10h45	International Standards Landscape Addressing End-of-Life Phase (Daniel L. Oltrogge-AGI)
10h45-11h05	Lessons learned from the application of the French Space Act (Isabelle Gibeck - CNES)
11h05-11h20	OneWeb Mission Overview and EOL Disposal Operations (Timothy Maclay-OneWeb)
15min	Coffee - Group Photo
11h35-12h30	AMC-9 a long road to graveyard orbit (Christèle Boddaert(TAS), Bénédicte Saint-Georges (TAS) Olivier Aventin (SES) Charles Law (SES))

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14h00-17h30	Afternoon session
14h00-14h25	Preparation for the EOL operations for Meteosat family satellites: re-orbiting, passivation and technology tests (Flavio Murolo - Eumetsat)
14h25-14h50	Metop- A End-of-Life: Plans and Opportunities for a Heritage LEO satellite (Andrew Monham - Eumetsat)
14h50-15h15	Assisted Natural Reentry (Claire Fremeaux - CNES)
15h15-15h40	The ReDSHIFT software tool for End-of-Life disposal design" (Elisa Maria Alessi - IFAC-CNR)
20min	coffee
16h00-16h20	Orbital debris: a growing problem and an innovative solution (Andrea Puppa - Astroscale)
16h20-16h45	Presentation of a tool (DESORB) dedicated to the optimization of a satellite deorbit maneuver (Loïc Perrot - SCILOC)
16h45-17h10	Design of end-of-life of disposal manoeuvres and re-entry modelling with semi-analytical techniques" (Stefan Frey and Ioannis Gkolas - Politecnico di Milano)
17h10-17h30	Smart-1 electric propulsion subsystem use during life extension around the moon (Frederic Marchandise - SAFRAN)

Focus points : Impressive presentation by SES and ThalesAlenia Space of the AMC-9 anomaly and operation to succeed to reach the graveyard orbite

Conclusion



- ▲ Challenging re-orbit:
 - Starting with only few Watts of array power and empty batteries
 - A spinning satellite and no on-board attitude control
 - Using oxidizer only
 - Some thrusters leaking
 - A depressurized fuel tank
 - Many units no longer functional
- ▲ Bold and perseverant effort to protect the geostationary region:
 - Six months of continuous operations
 - Over 50 people on the deck
 - An excellent cooperation between the teams of all companies involved
 - Real team effort with a strong commitment to achieve this challenging re-orbit
- ▲ AMC-9 has been successfully removed from the GEO protected region and passivated, complying with international IADC guidelines

