

Area di Ricerca del CNR  
Istituto Nazionale di Astrofisica  
Radio Astronomia



Bologna, 18 e 19 Maggio 2018.

SRITAC 2 - 2018 - Officine orbitali, primo livello di espansione civile nello spazio

# **Recupero dei Detriti e Rottami Spaziali e Scenari per il loro Riutilizzo**

***STEFANO ANTONETTI – D-ORBIT***

# 78 CONSTELLATIONS: 23,000+ SATELLITES





PSLV-C37 CARTOSAT 2 S MISS

ONBOARD CAMERA

NANO SATELLITES P+ SIDE SEPARATION







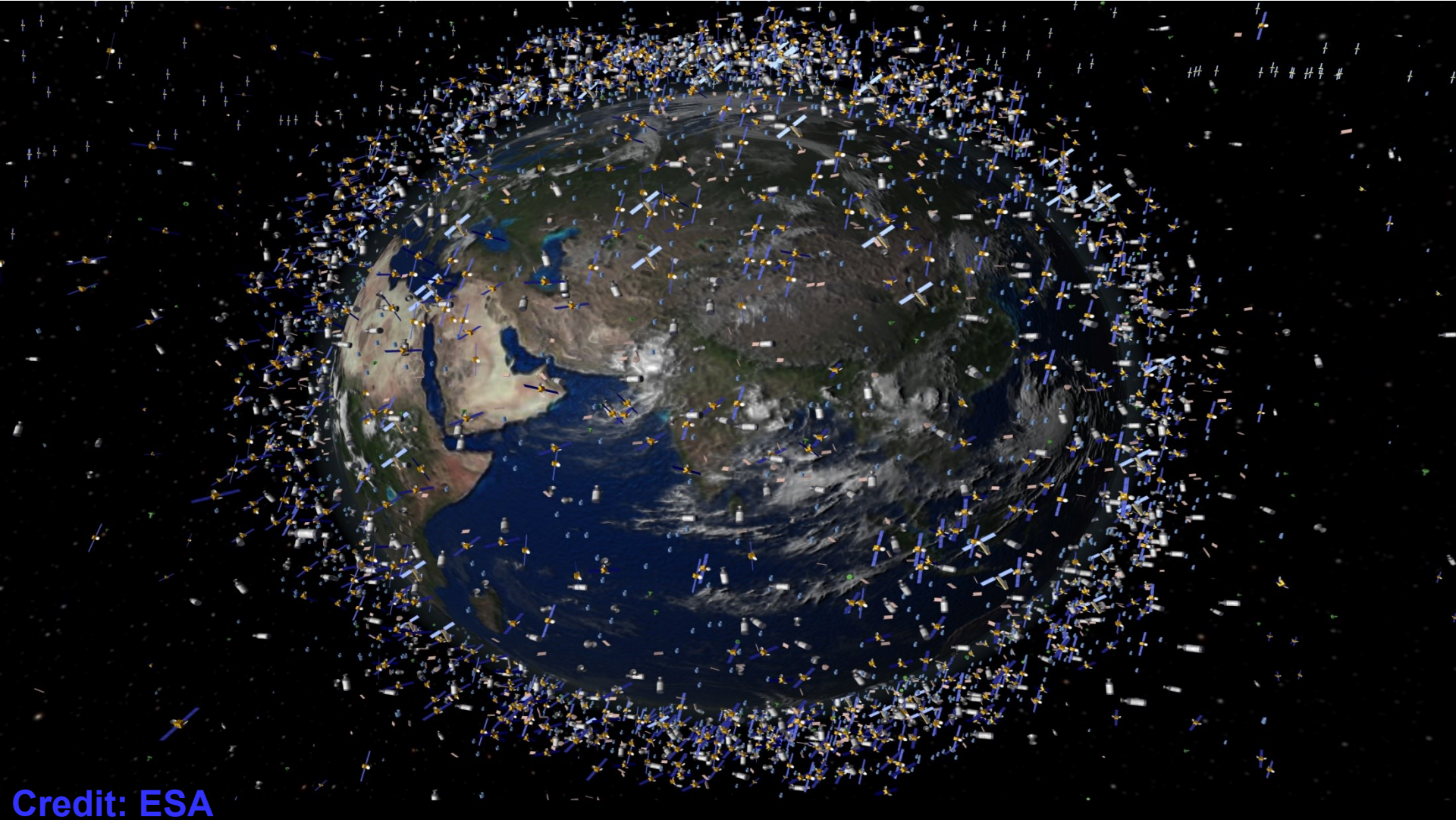
Credit: NASA

# WHAT'S THE CATCH?

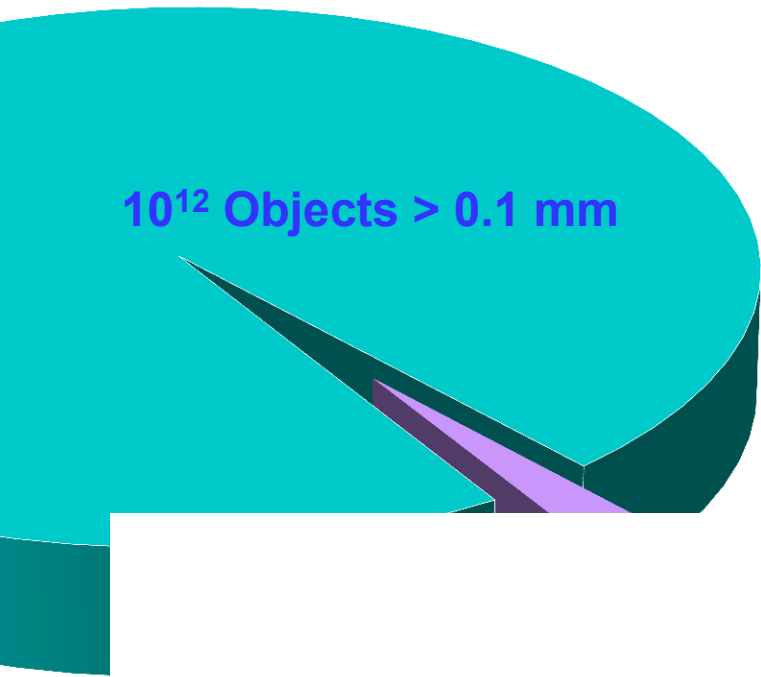






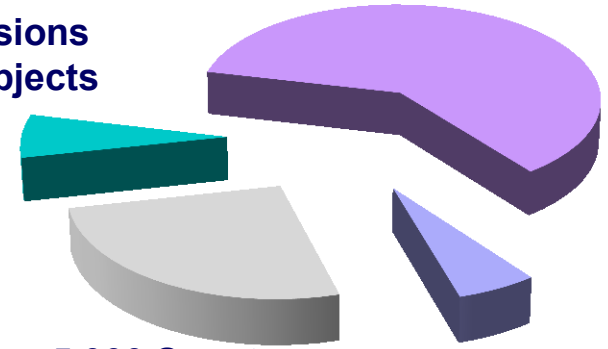


Credit: ESA



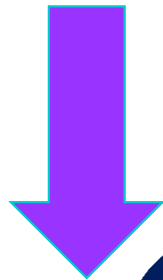
**1 500 Missions  
Related Objects**

**11 000 Fragments**

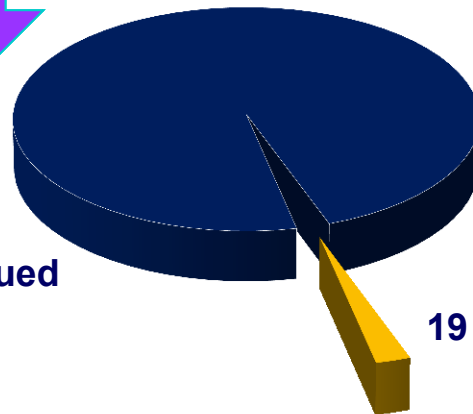


**5 000 Spent  
Satellites and  
Rocket Stages**

**1 750  
Active  
Satellites**

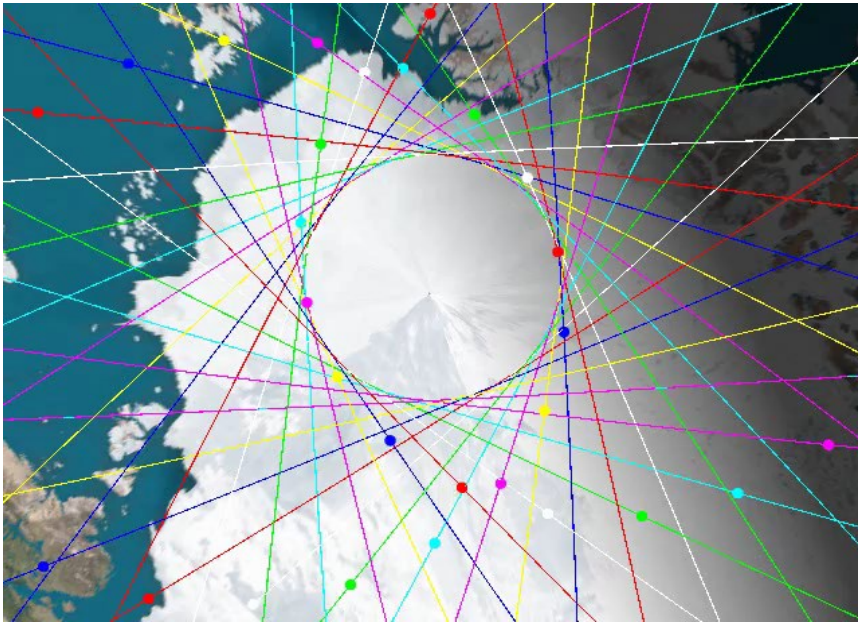


**Not Catalogued**

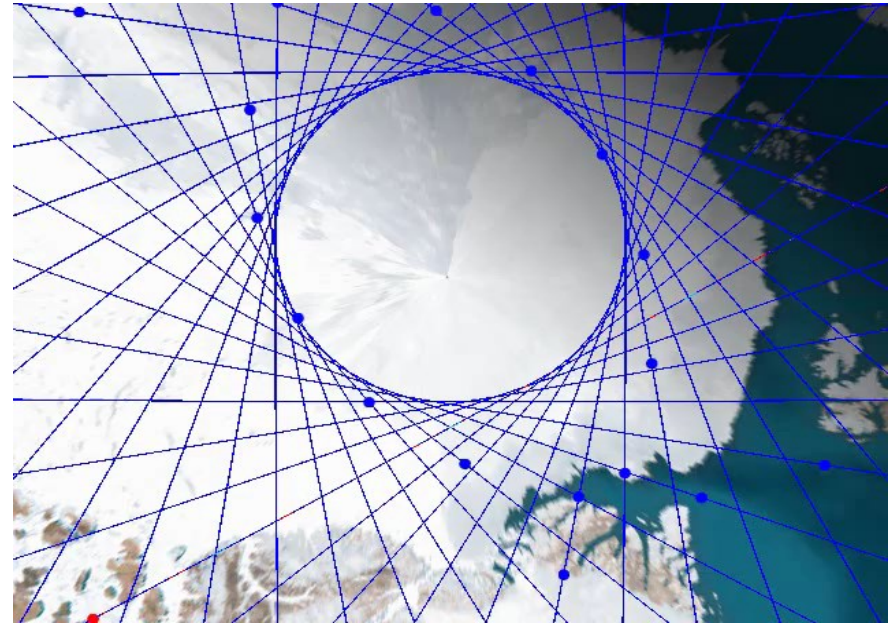


**19 164 Catalogued Objects**

# LARGE CONSTELLATION



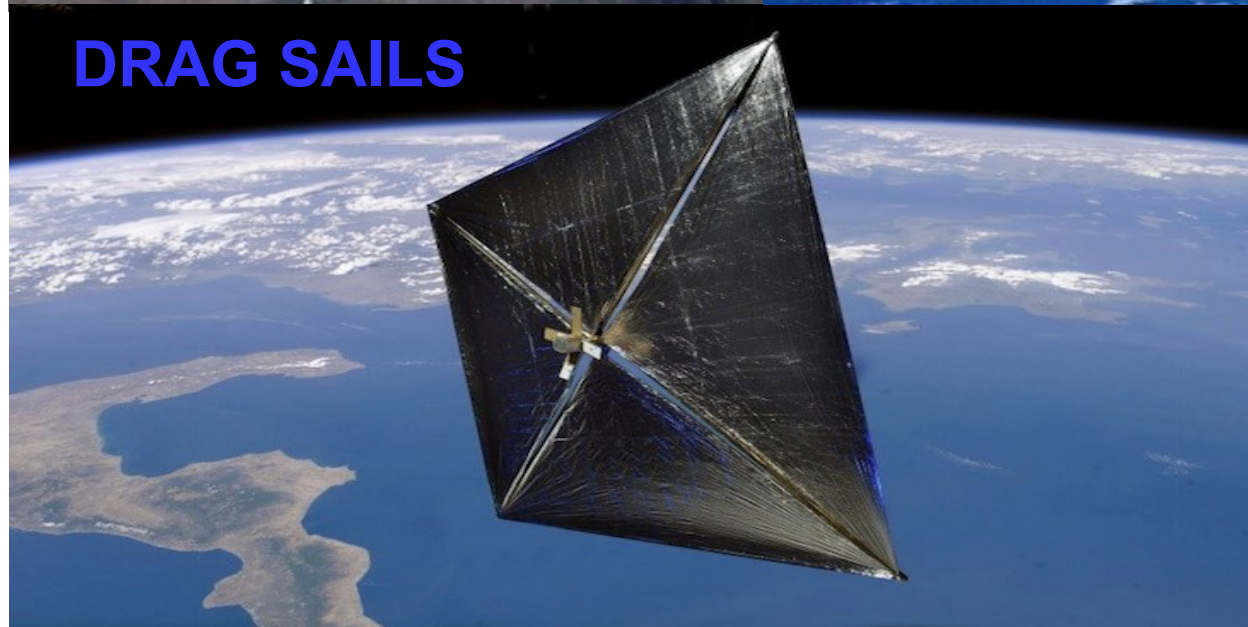
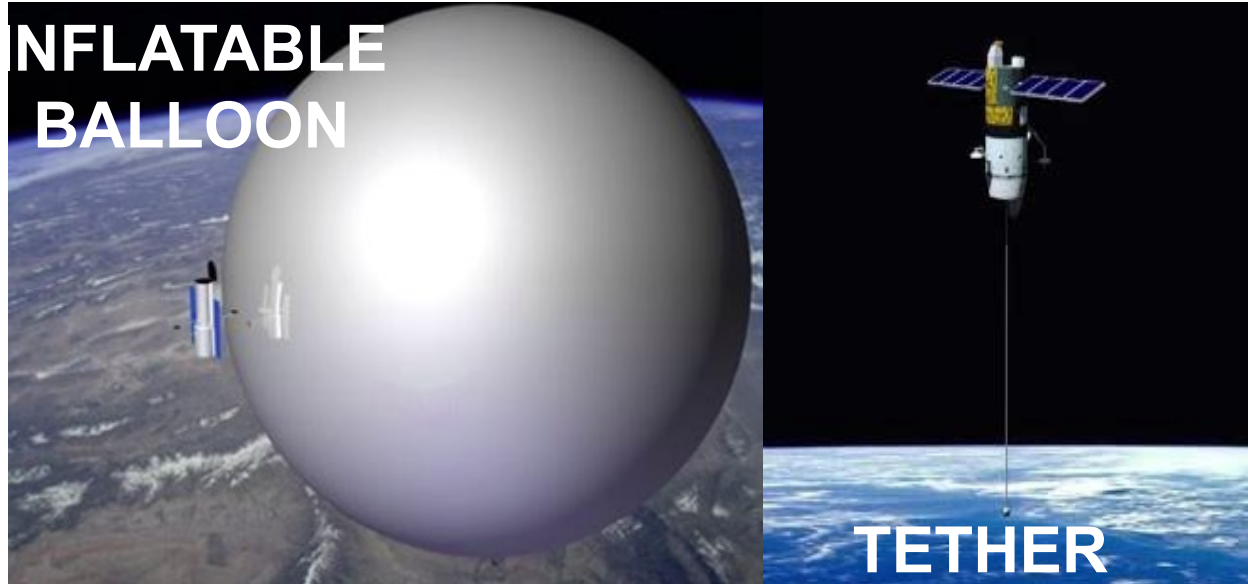
**IDEAL CASE**



**3 DEFUNCT SATELLITES**

# MITIGATION

***“If you don’t know how to solve a problem,  
stop causing it”***

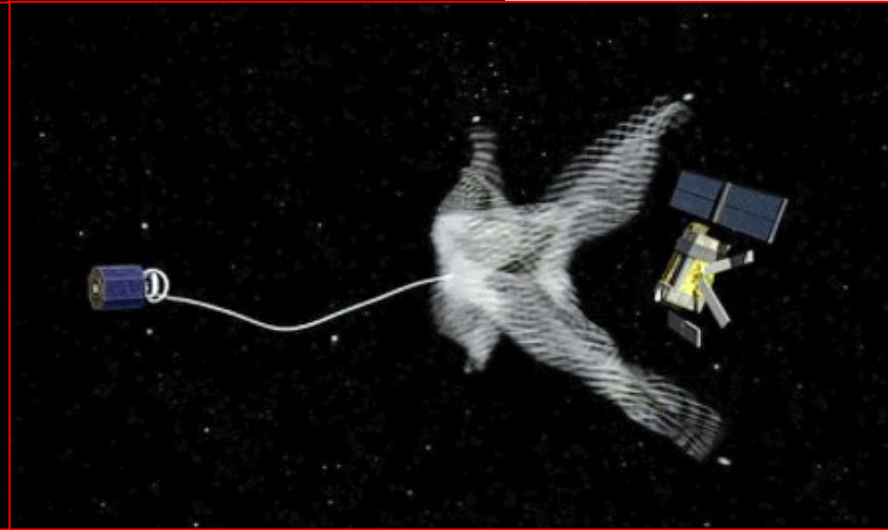
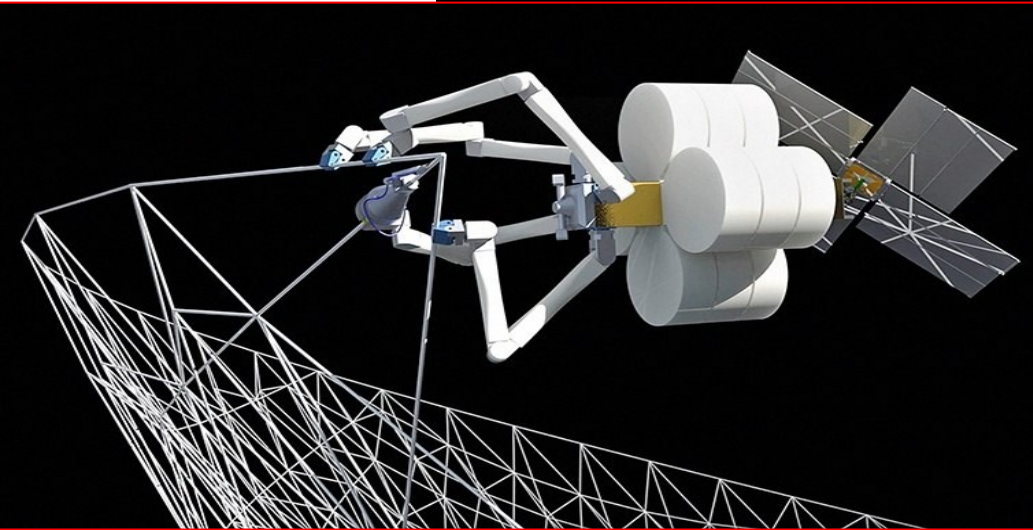
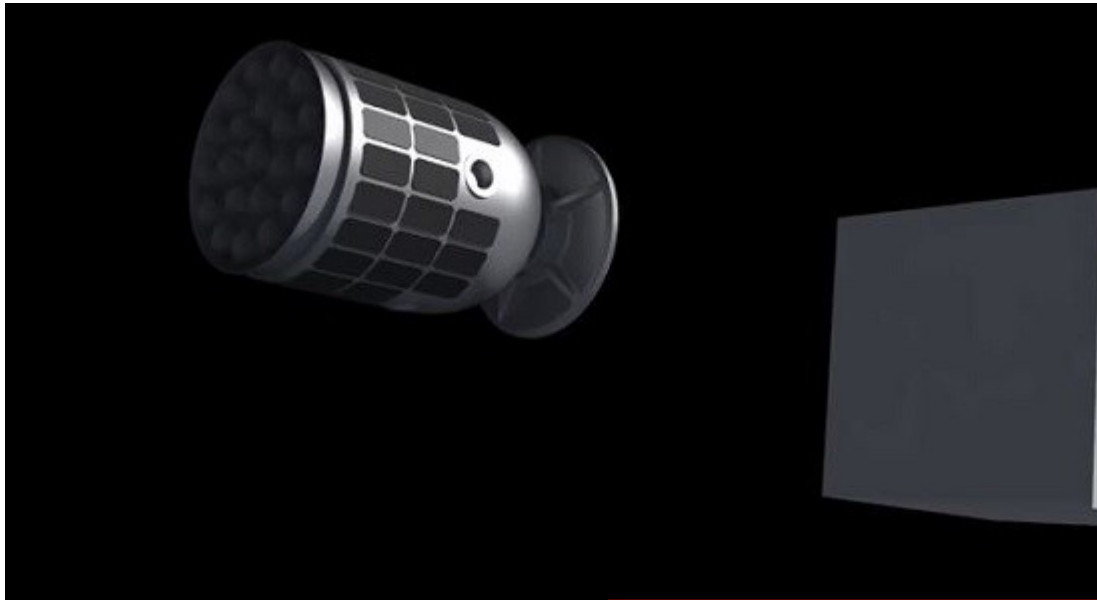


# AUTONOMOUS DEORBITING KITS



# REMEDICATION

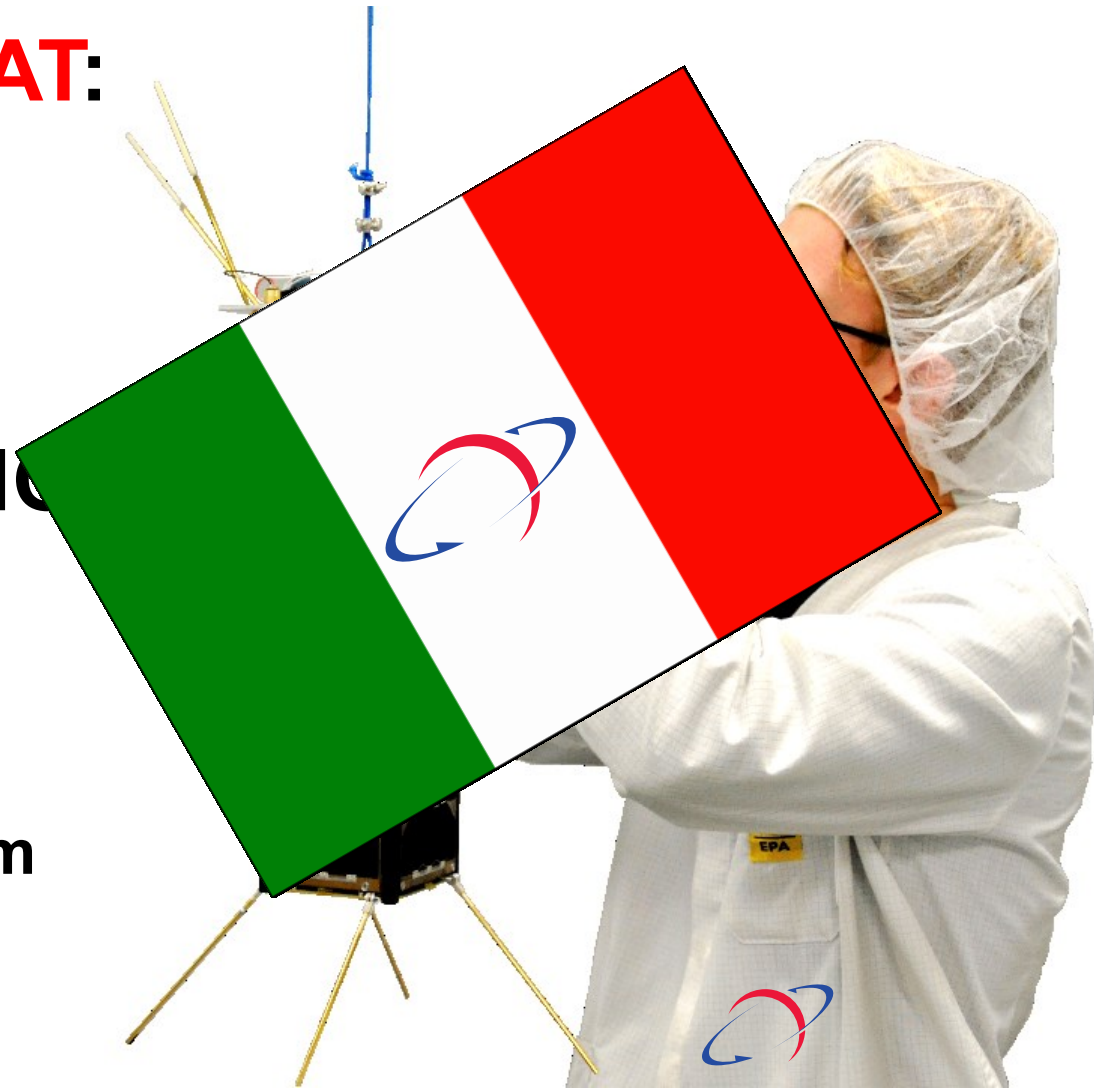
*“Brains are better than brawn”*



October 2017, **D-SAT:**

**FIRST SATELLITE  
TO PERFORM A  
DECOMMISSIONING  
MANOEUVRE**

**by an independent  
Decommissioning system**



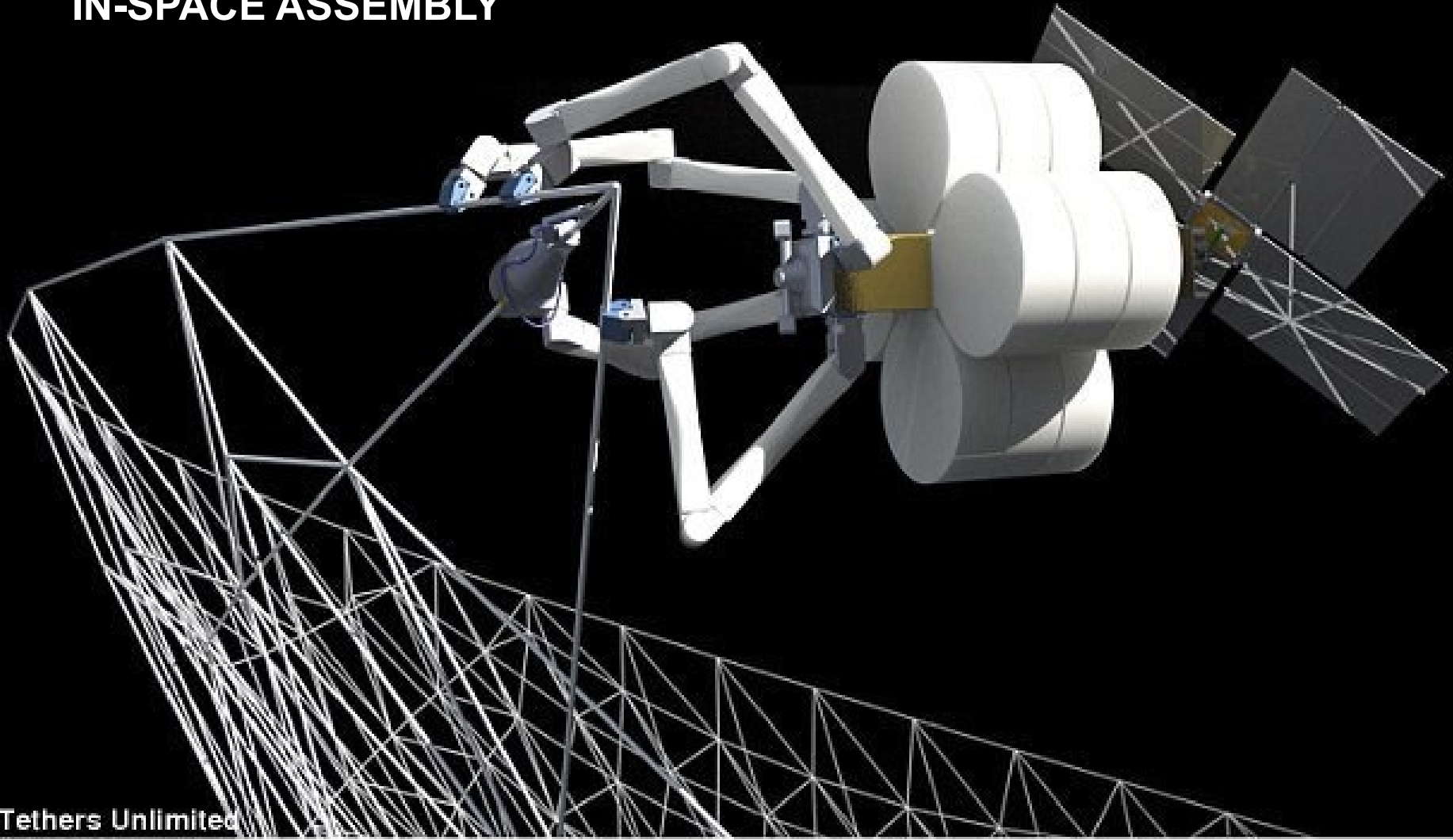




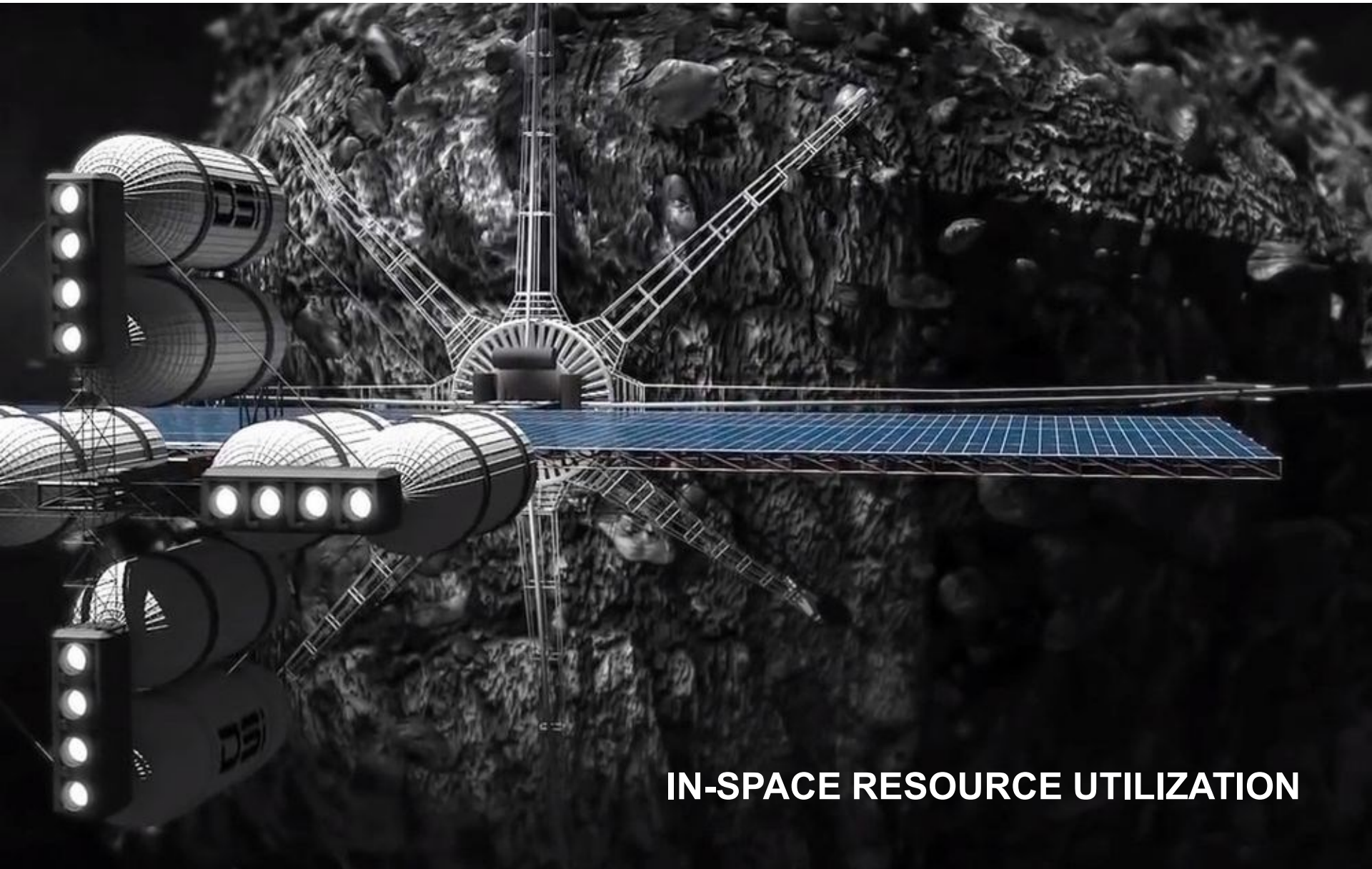




## IN-SPACE ASSEMBLY

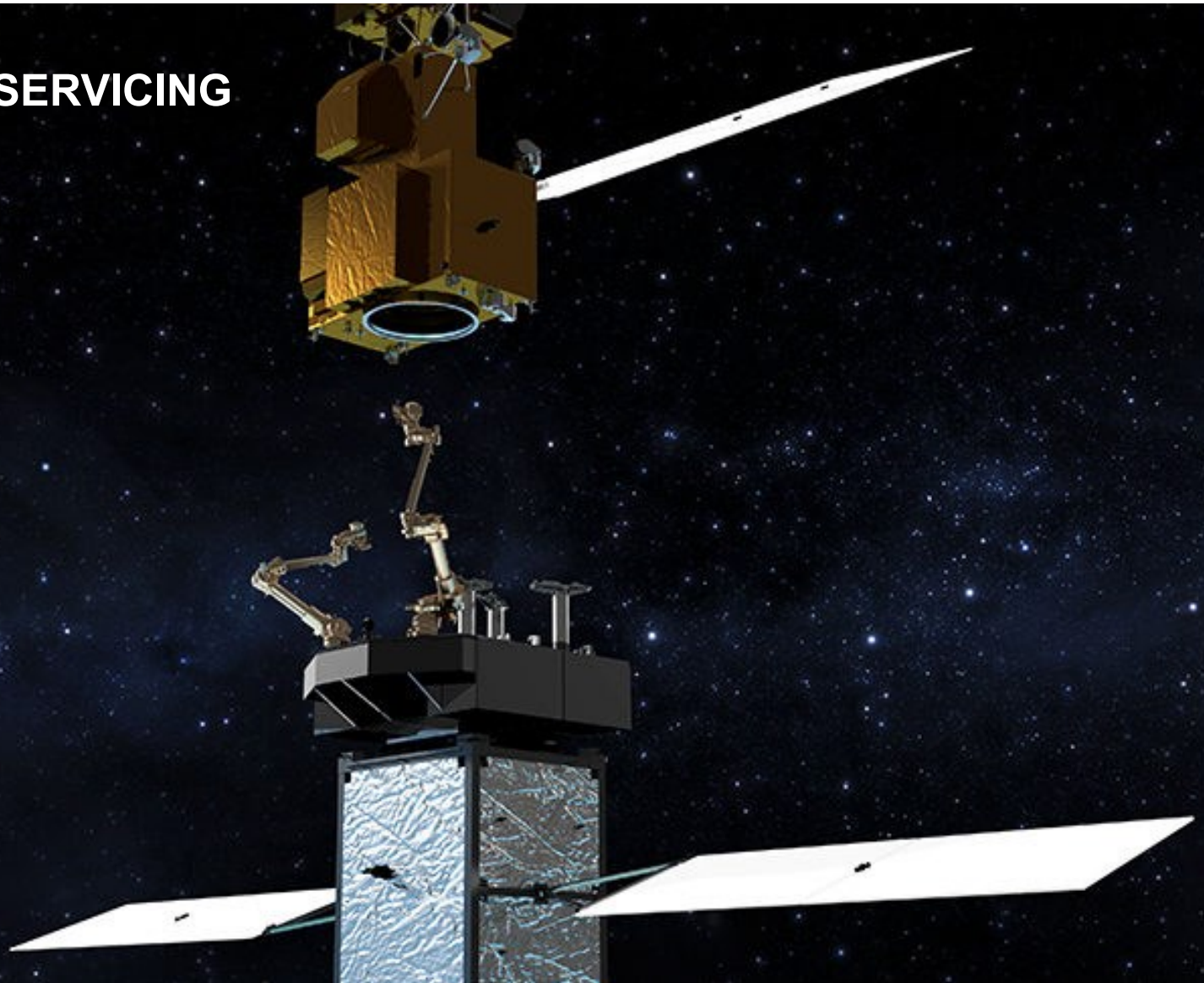


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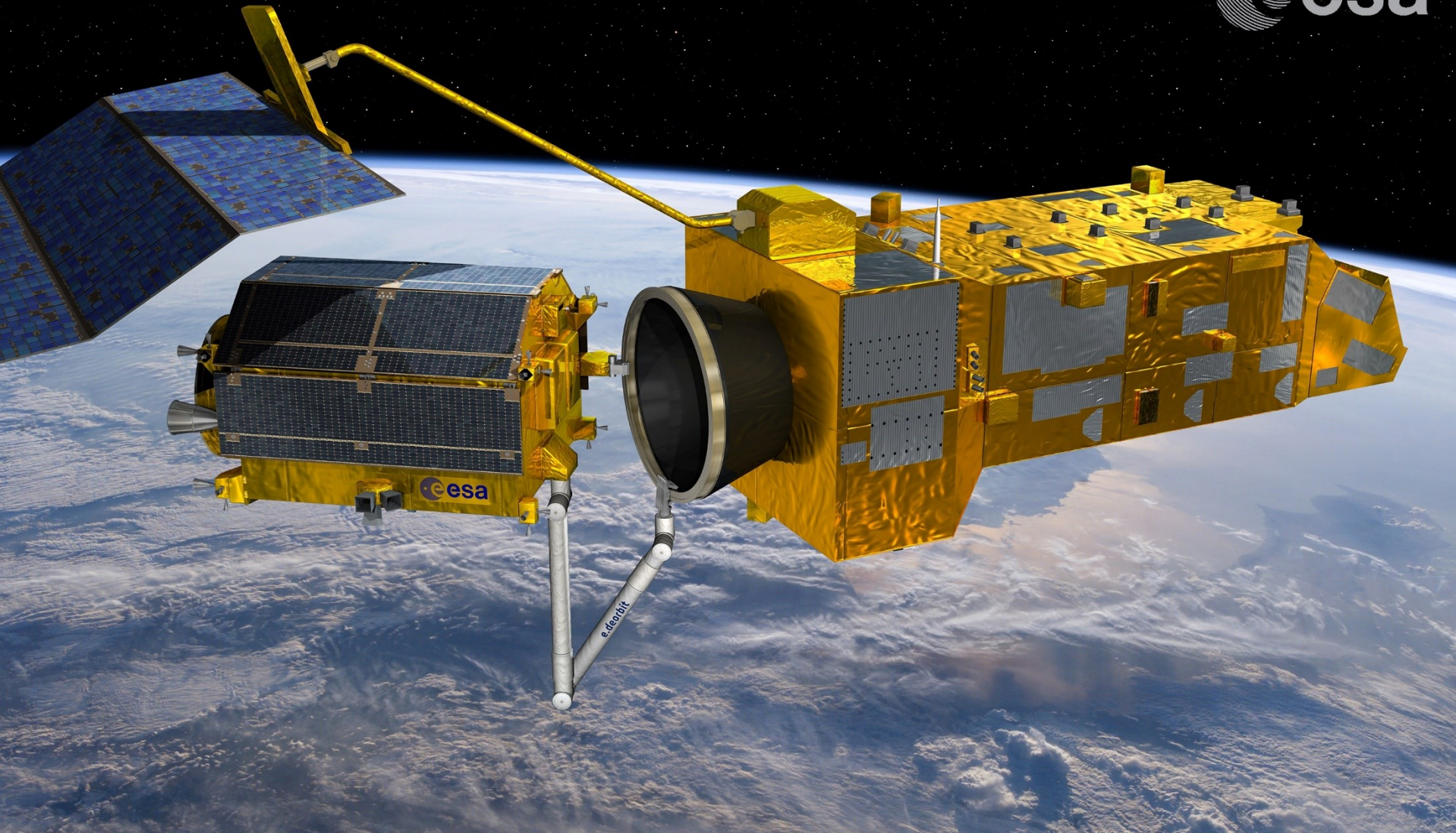


## IN-SPACE RESOURCE UTILIZATION

## IN-ORBIT SERVICING



# IN-ORBIT SERVICING





## WHAT'S MISSING HERE?



## IN-SPACE TRANSPORTATION

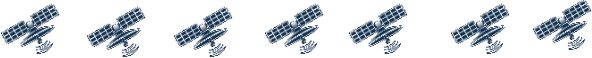


**BE MORE  
AWESOME**

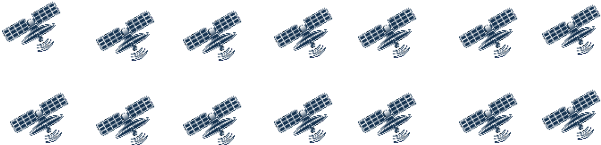


# LEAVING SATELLITE IN SPACE: 25 YEARS RULE

## Example Scenario: 650 satellites

Operational altitude  LARGE CONSTELLATION

 Decommissioning Manoeuvre (300 sat per year)

600 km  5 years = +1500 sat  
10 years = +3000 sat

 25-year re-entry

