

# Space Debris related Activities at ESA

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ESA/ESOC Space Debris Office

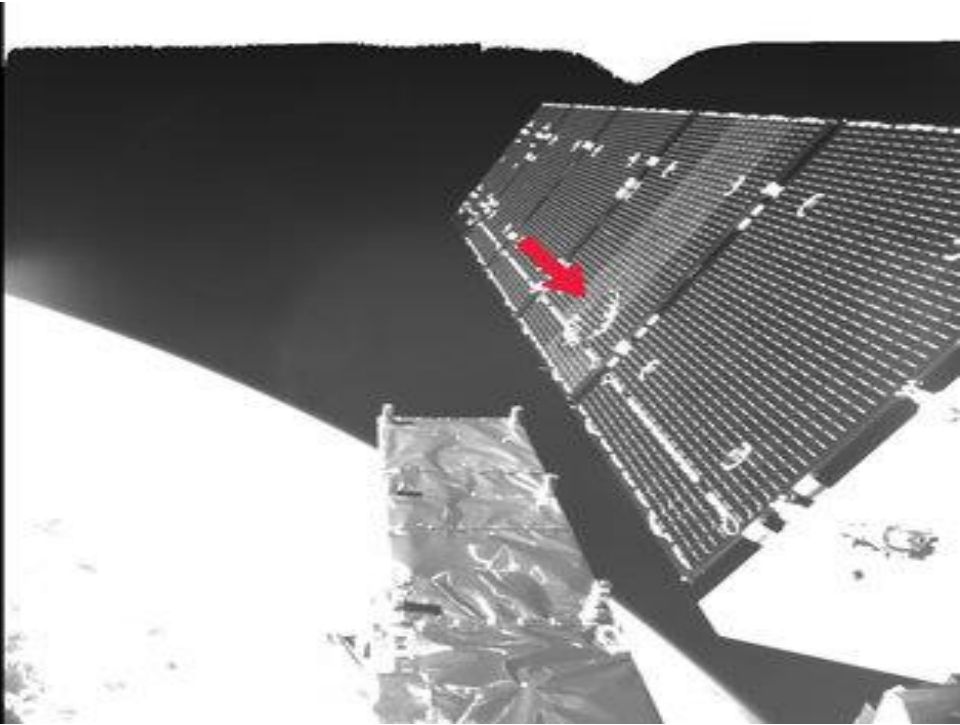
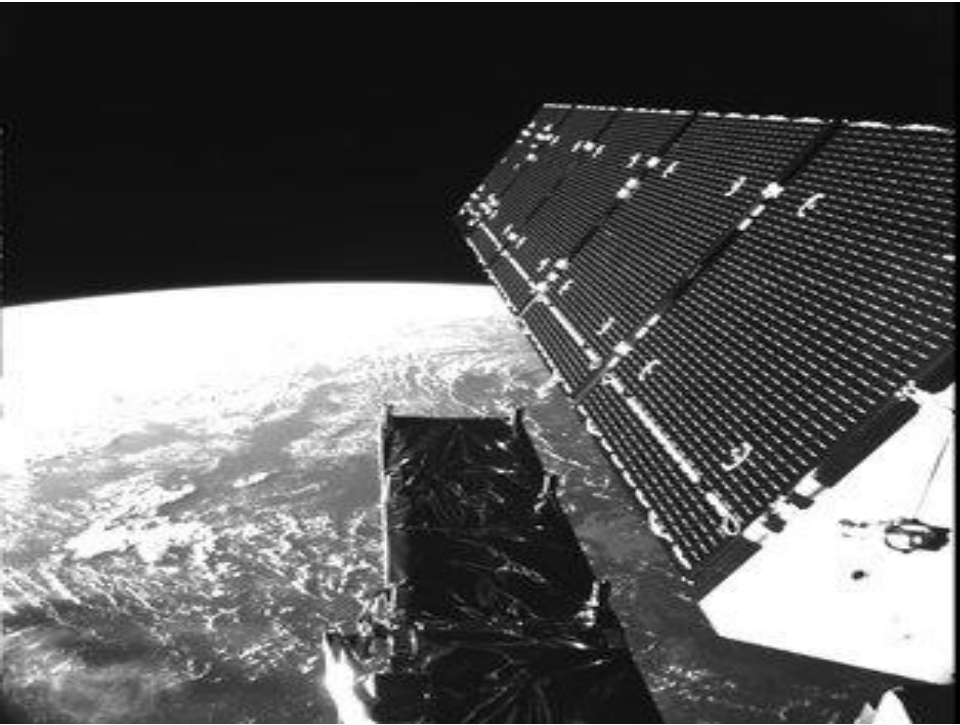


>1mm





# Sentinel-1A Impact 2016/08/23 – onboard camera



**business  
as usual**

**object  
count**

**time**

**2010**

# ESA Debris Mitigation Process



## Inter-Agency Space Debris Coordination Committee



ECSS-U-AS-10C  
10 February 2012

**Space sustainability**

Adoption Notice of ISO 24113:  
Space systems - Space debris  
mitigation requirements

**ECSS-U-AS-10C  
Space sustainability -  
Adoption Notice of ISO 24113  
(10/02/2012)**

ECSS Secretariat  
ESA-ESTEC  
Requirements & Standards Division  
Noordwijk, The Netherlands

iadc-online.org

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**DOCUMENT**

ESA Space Debris Mitigation Compliance Verification  
Guidelines

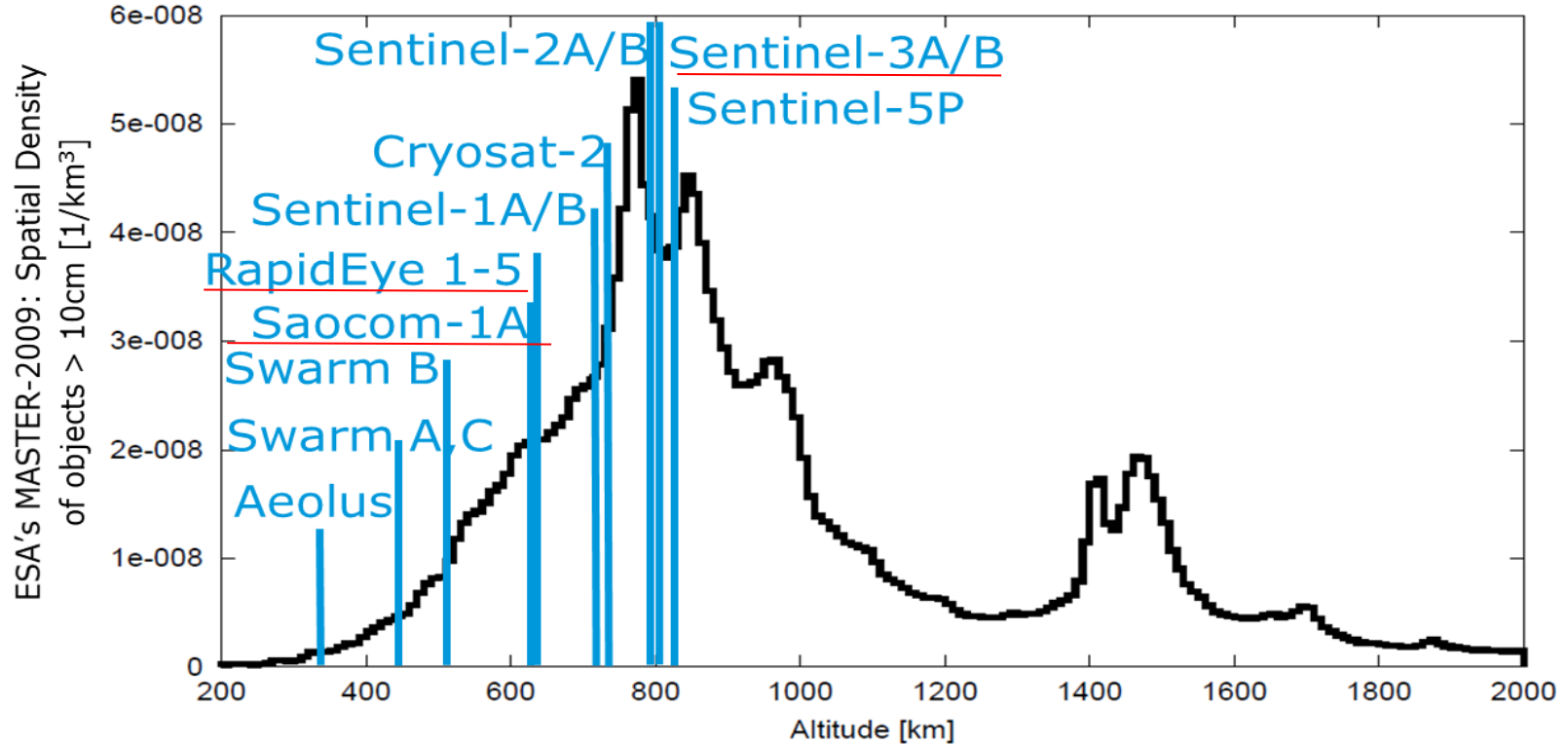
**ESSB-HB-U-002  
ESA Space Debris Mitigation  
Compliance Verification Guidelines  
(19/02/2015)**

Prepared by	ESA Space Debris Mitigation WG
Reference	ESSB-HB-U-002
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Status	Approved
Document Type	HB
Distribution	ESA

European Space Agency  
Agence spatiale européenne



# Collision Avoidance in ESA



**Envisat** upper stage

**02:53:18.00**  
**2010/01/21**

# The new DISCOS Web Frontend



Object Path

Path Name: object-path  
Entry Point field: COSPARID  
Entry Point value: 2012-006A

Name	LARES
COSPARID	2012-006A
SATNO	38077
Mass	400.000 kg
Classification	Payload
Shape	Sphere
Length	0.400 m
Height	0.400 m
Depth	0.126 m <sup>2</sup>
X SECT: MAX	0.126 m <sup>2</sup>
X SECT: MIN	0.126 m <sup>2</sup>
X SECT: AVG	0.126 m <sup>2</sup>
X SECT: RMS	0.039 m <sup>2</sup>
Re-entry epoch	2013-01-01
Country	ITALY
Organization	Italian Space Agency

Image

COSPARLaunchNumber	2012-006
LauncherName	Vega
Site	Guiana Space Center (France)
PROB: UTILITY: DATE	2012-000000
REMAINING LIFE TIME: UNCLASSIFIED	2012-000000
Mission Type	Technology
Activity Status	(value not available)

Launch Number

LATEST ORBITS

Status	Regime	Orbit Epoch	SMA (km)	EOC	INC (deg)	A PER (deg)	EQUTAL
No filter applied							
ON ORBIT	Low Earth Orbit	2012-02-02	7822.07911	0.001063	89.4941	297.1153	114.747444

INITIAL ORBITS

Status	Regime	Orbit Epoch	SMA (km)	EOC	INC (deg)	A PER (deg)	EQUTAL
No filter applied							
	Low Earth Orbit	2012-02-13	7220.14	0.019940127	89.51	-46	101.99
	Low Earth Orbit	2012-02-14	7220.14	0.019940127	89.51	-46	101.99
	Low Earth Orbit	2012-02-15	7220.14	0.019940127	89.51	-46	101.99
	Low Earth Orbit	2012-02-24	7822	0.0011182	89.49	299	114.75

## Launch Path

Path Name: launch-path  
Entry Point field: COSPARLaunchNumber  
Entry Point value: 2012-006

Launch date	2012-02-13
LauncherName	Vega
Number of payloads	9
Flight number	VV01
Related objects	10
Launcher Image	(value not available)

### RELATED OBJECTS

COSPARID	SATNO	Name	OBJECT CLASS	Regime
No filter applied				
2012-006A	38077	LARES	Payload	Low Earth Orbit
2012-006B	38078	ALMASat	Payload	Low Earth Orbit
2012-006C	38079	e-st@r	Payload	Low Earth Orbit
2012-006D				
2012-006E				
2012-006F				
2012-006G				
2012-006H				
2012-006J				
2012-006K				

### Launches per Launcher with Country

Launcher	Percentage
Ariane 5G	5%
Ariane 3	5%
Ariane 1	5%
Ariane 44LP	5%
Delta 2914	5%
Soyuz-FG Fragat	5%
Ariane 5ECA	5%
Ariane 5ES	5%
Rokot-KM	5%
Soyuz-ST-B Fragat-MT	19%
Ariane 40	5%
Delta 3914	5%
Soyuz-U Fragat	5%
Vega	5%
Ariane 5G+	5%
Dnepr	5%
PSLV	5%
Proton-K/DM-2	5%
Atlantis (OV-104)	5%
Other	5%





HOME

SIGN-IN

FORGOT PASSWORD

CREATE ACCOUNT

CONTACT US

SPACE DEBRIS USER PORTAL > HOME

This portal addresses the user community of ESA's Space Debris Software. It serves as entry gate for software license applications and for the retrieval of the software. Registered users may retrieve updated data and software patches and may raise support requests.

### THE FOLLOWING ESA SPACE DEBRIS TOOLS CAN BE REQUESTED:

#### MASTER

MASTER (Meteoroid and Space Debris Terrestrial Environment Reference) allows to assess the debris or meteoroid flux imparted on a spacecraft on an arbitrary earth orbit. MASTER also provides the necessary computational and data reference for DRAMA and needs to be installed before DRAMA is installed.



#### DRAMA

DRAMA (Debris Risk Assessment and Mitigation Analysis) is a comprehensive tool for the compliance analysis of a space mission with space debris mitigation standards. For a given space mission, DRAMA allows analysis of:

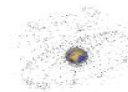
- Debris and meteoroid impact flux levels (at user-defined size regimes)
- Collision avoidance manoeuvre frequencies for a given spacecraft and a project-specific accepted risk level
- Re-orbit and de-orbit fuel requirements for a given initial orbit and disposal scenario
- Geometric cross-section computations
- Re-entry survival predictions for a given object of user-defined components
- The associated risk on ground for at the resulting impact ground swath



*Please beware that the installation of MASTER is a necessary pre-condition for the successful operation of the DRAMA suite. MASTER provides the necessary computational and data reference for DRAMA and needs to be installed before DRAMA is installed.*

#### DISCOSWEB

DISCOS (Database and Information System Characterising Objects in Space) serves as a single-source reference for launch information, object registration details, launch vehicle descriptions, spacecraft information (e.g. size, mass, shape, mission objectives, owner), as well as orbital data histories for all trackable, unclassified objects which sum up to more than 40000 objects. Today, DISCOS not only plays an essential role in the various daily activities at the ESA's Space Debris Office, and it is the basis for operational processes in collision avoidance, re-entry analyses, and for contingency support. DISCOS also provides input to numerous and very differently scoped engineering activities, within ESA and throughout academia and industry. DISCOS-based routine activities also comprise the maintenance of a Re-entry Events Database to



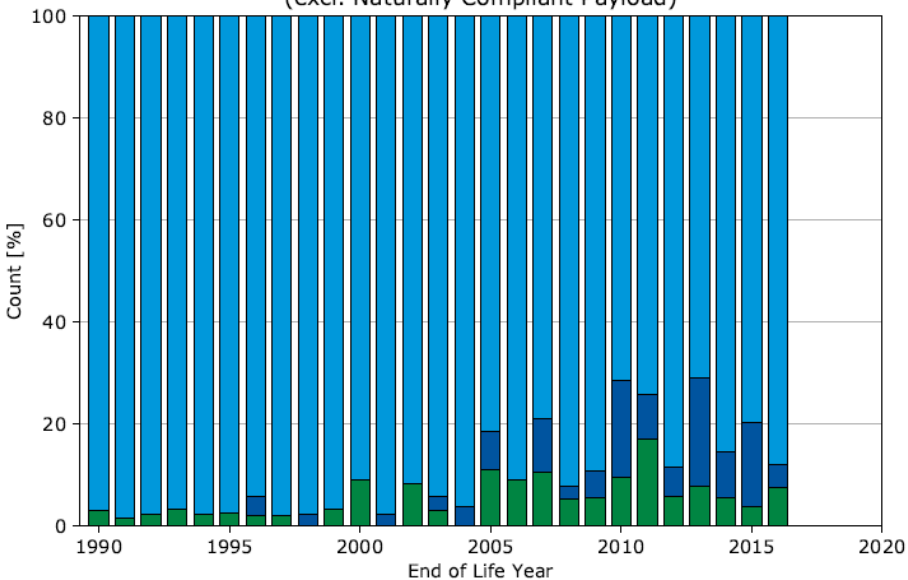
<https://sdup.esoc.esa.int>

# Current Behaviour: Post Mission Disposal in LEO

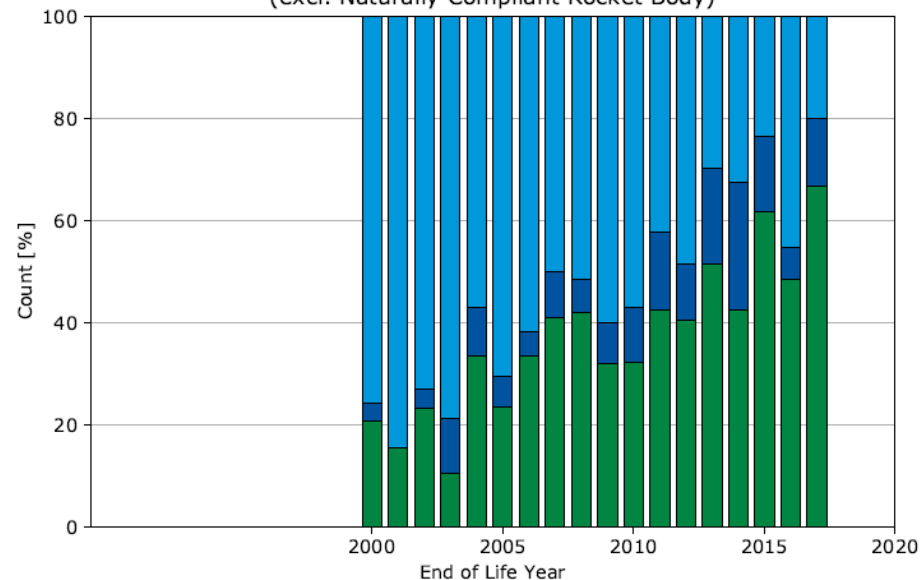


- No Attempt
- Insufficient Attempt
- Successful Attempt

Payload Clearance in Low Earth Orbit  
(excl. Naturally Compliant Payload)



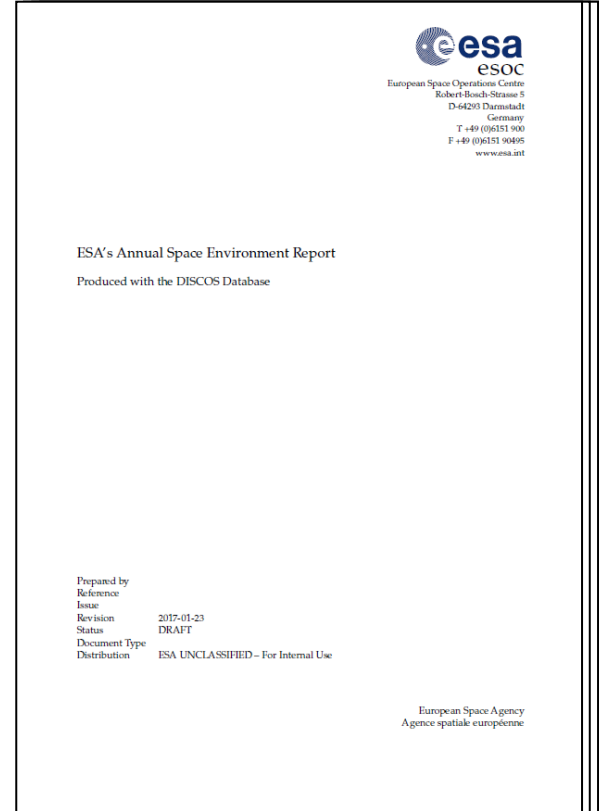
Rocket Body Clearance in Low Earth Orbit  
(excl. Naturally Compliant Rocket Body)



# ESA Annual Space Environment Report

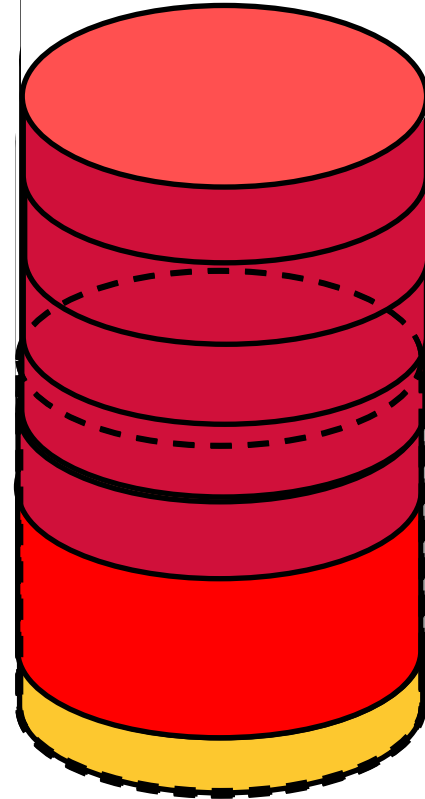
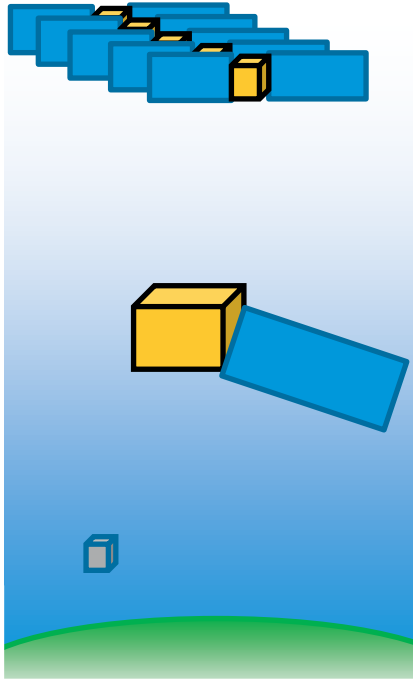


[www.esa.int/debris](http://www.esa.int/debris)

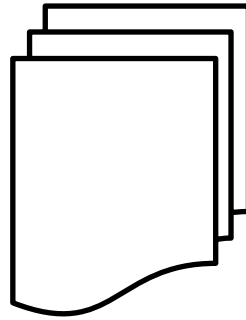
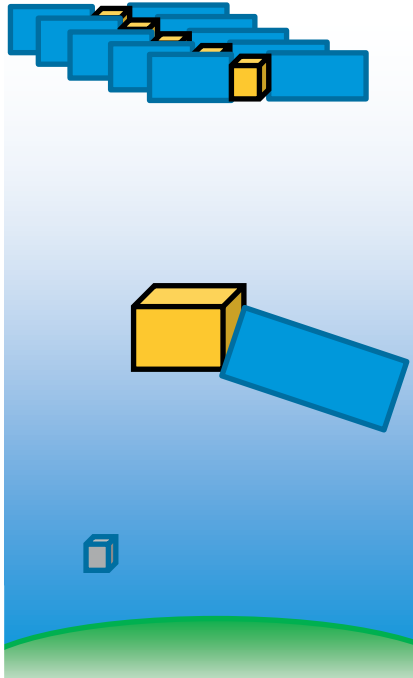




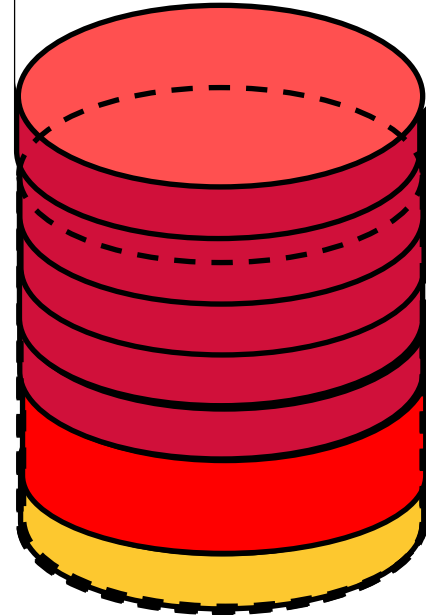
# Consumption of Space



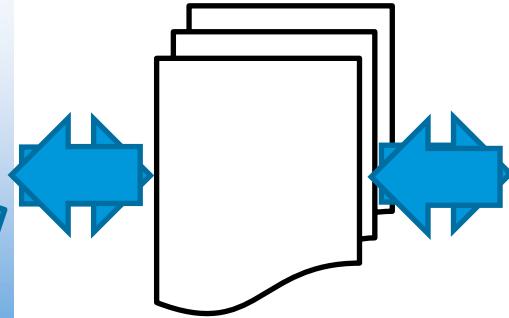
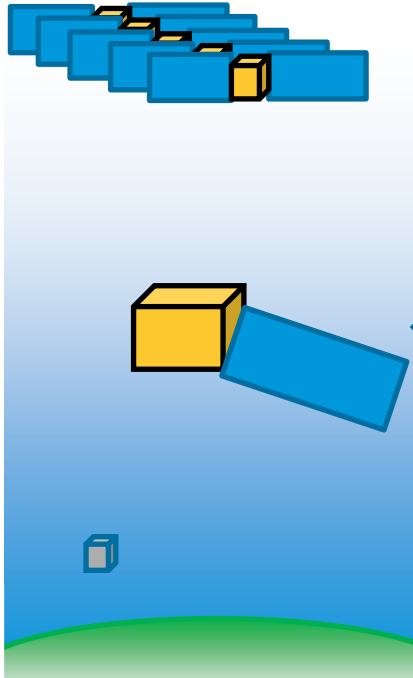
# Effect of Current Guidelines



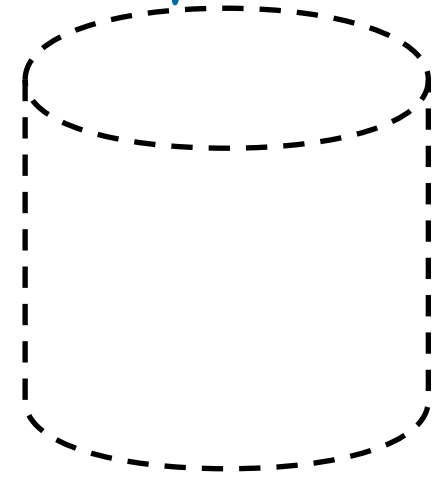
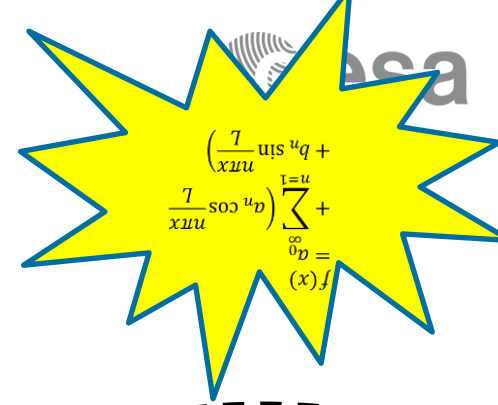
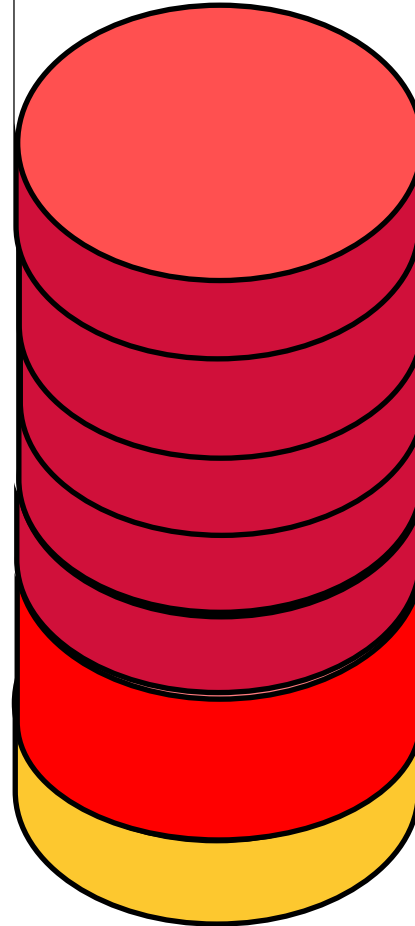
Guidelines



# Top-Down Approach



Guidelines





# e.Deorbit Mission Scenario



FEB 2024

TARGET INSPECTION



MAR 2024

RENDEZVOUS AND SYNCHRONISATION



MAR 2024

TARGET CAPTURE

MAR 2024

STABILISATION



JAN 2024

TRANSFER AND PHASING TO TARGET ORBIT



JAN 2024

COMMISSIONING AT 300 km CIRCULAR ORBIT



JAN 2024

LAUNCH VEGA-C



“To remove an ESA-owned debris from 800-1000 km (near polar region)”

APR 2024

DISPOSAL



ESA UNCLASSIFIED - For Official Use

Clear Space | 22/02/2017



European Space Agency



Next Event: ESA NEO and DEBRIS DETECTION CONFERENCE  
<https://neo-sst-conference.sdo.esoc.esa.int/>



- Coming up next:
  - ESA/ECSL space debris regulation, standards and tools workshop
  - ESOC, Darmstadt Germany, March 19-21
  - [Holger.krag@esa.int](mailto:Holger.krag@esa.int)

