

# Detumbler-M

Changing the game  
for Active Debris Removal



A v i o n i c s



Tumbling can be caused by propulsion failures, impacts by debris, or simply the slow accumulation of tiny external disturbances over time. The extreme challenges of capturing debris with large tumbling rates have been holding back Active Debris Removal initiatives. By ensuring that satellites which remain stranded in orbit are *not* tumbling, the Detumbler changes the game for ADR missions, and ultimately for space debris mitigation.

### A breakthrough for sustainability

Accommodating a Detumbler on all LEO missions is a key enabler for affordable and timely ADR in the future:

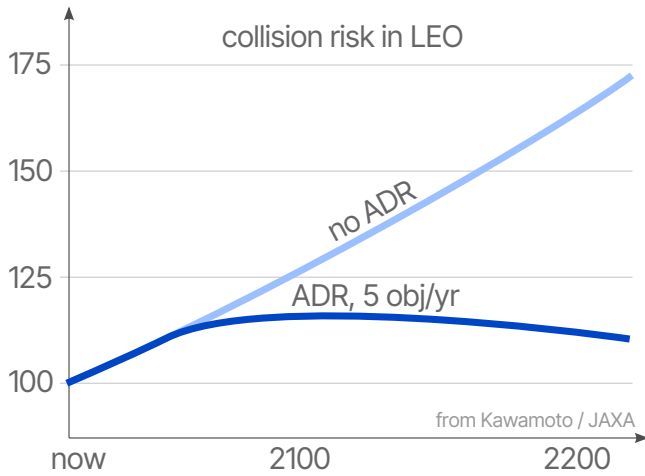
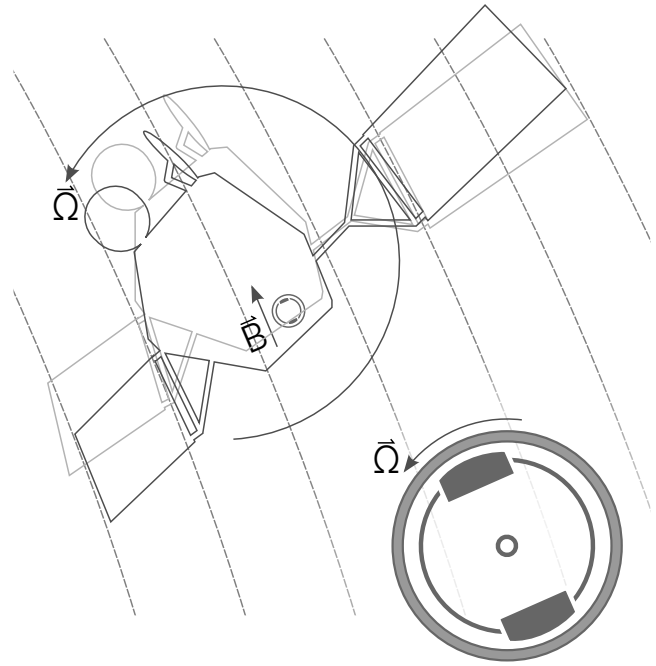
- chaser vehicle can be smaller
- proximity operations are safer
- grabbing system can be simpler
- post capture transient is much smoother

The agencies (CNES, ESA) are in the process of making a detumbling function mandatory in LEO.

The Detumbler is a small passive device which guarantees that a spacecraft will not end up tumbling if it dies in orbit. It behaves like a tiny induction brake: while keeping the rotor aligned with the Earth's magnetic field, the device's small magnets cause eddy currents in the conductive housing, slowly dissipating the satellite's kinetic energy.

## How it works

When the spacecraft is tumbling, the differential angular rates between the device's housing (attached to the satellite) and the magnetized rotor (locked onto the Earth's magnetic field) are slowed down by eddy currents caused by the rotor magnets travelling close to the conductive housing.



## Avoiding cascading collisions

Post-mission disposal alone will not be sufficient to prevent Kessler syndrome. Statistically, some satellites will remain stranded. This is even more critical with (and within) large constellations.

Active Debris Removal has the potential of curbing the runaway collision risk. But the extreme challenges of capturing debris with potentially large tumbling rates have been holding back initiatives and impeding the prospects of a viable business model for ADR.

## Developed by Airbus for next-generation debris mitigation solutions

### 2021 - 2025 CNES R&T and Airbus R&D

- ✓ funct. consolidation and performance
- ✓ detumbling/ antitumbling simulations
- ✓ detailed sizing tool
- ✓ compatibility with AOCS
- ✓ trade-off on technology alternatives
- ✓ manufacturing of breadboards
- ✓ vibration, shock, thermal and friction tests

### 2026 Product qualification

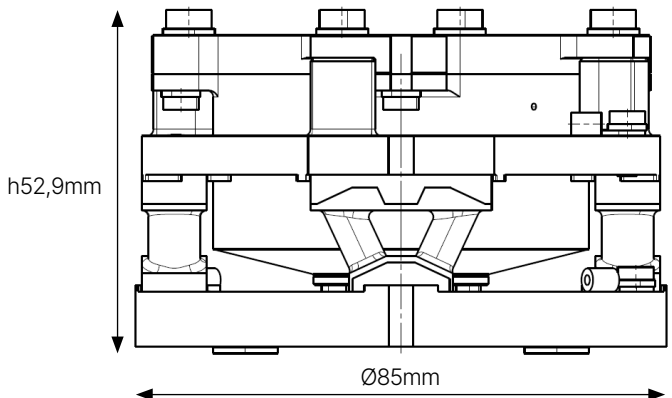
- ✓ Mechanical environment - passed
- ✓ Thermal environment - passed
- ✓ Life testing - passed
- ✓ First flight models : 2026

### Patents

- 2016 - EP3538441B1 - Tourneur/Lagadec
- 2021 - FR2110081 - Boyer/Lagadec
- 2023 - WO2023047049 - Brault/Lagadec

Key Features & Performances	
mass	209 g (+/-5%)
size	h53mmØ85mm
orbit altitude	up to 2000 km
orbit inclination	all
satellite inertia range	50 - 5000 kg.m <sup>2</sup>
detumbling time	5 - 500 days
anti tumbling capability	up to 5 μNm avg. SRP
S/C rate after detumbling	< 0.2 deg/s
service life	up to 25 years (dependent to magnetorquers command)
temperature range	-90° C to + 80° C
power	0W (100% passive)
disturbance torque on S/C	< 50 μNm
units needed per S/C	1

## Dimensions



Ready to prevent tumbling and support ADR missions?  
Contact Airbus Space Electronics to explore how this solution can support your mission