

DOM[®]

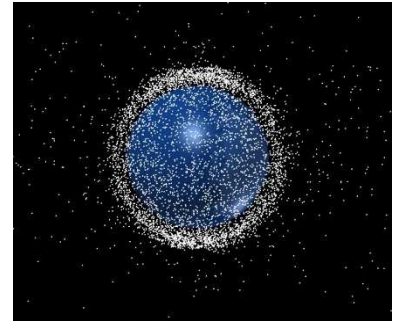
The solution to the problem of space debris



Nakashimada Engineering Works, Ltd.

Problem of Space Debris

In order to bring more conveniences to people of the Earth, demand for microsatellites has been greatly increasing in recent years. Yet after their operation are accomplished, these satellites are left on orbit and become "space debris" that often draw serious calamities around the Earth. Thus, resolving this space-debris problem is an urgent issue to protect future life of all people.



What's "DOM" ?

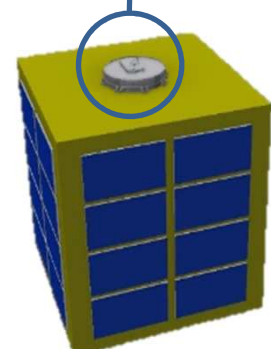
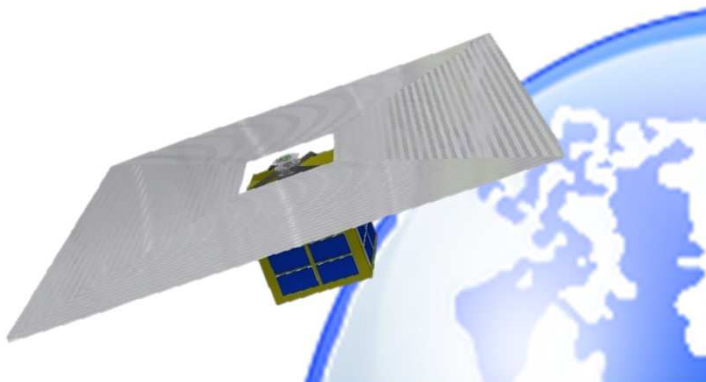
"DOM" the De-Orbit Mechanism, was developed as a device that departs the satellite from orbit after the operation.

DOM functions by the following process:

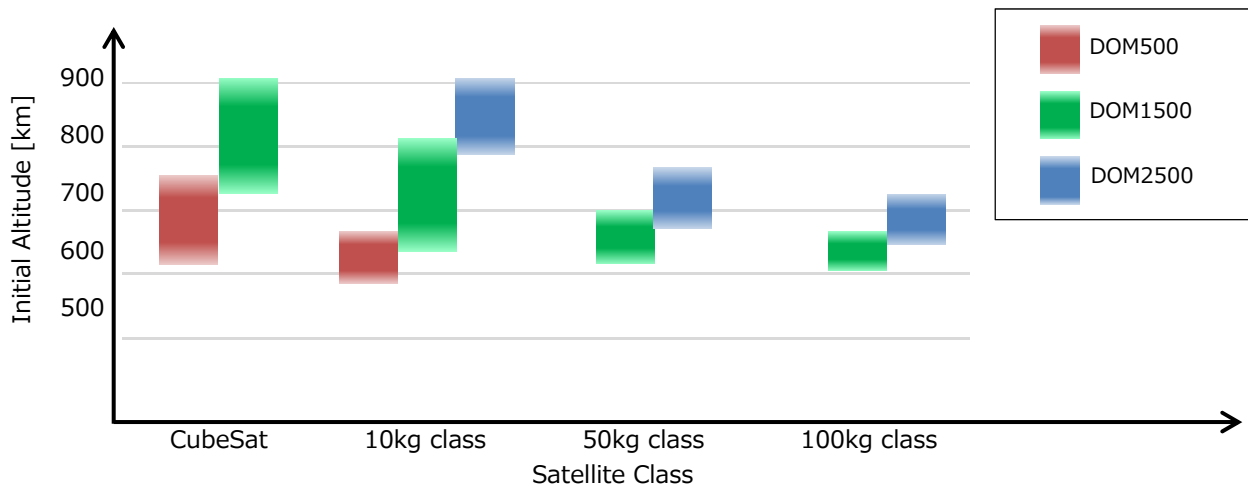
1. DOM is loaded to the satellite prior to the launch of the satellite.
2. After the operation of the satellite is accomplished, DOM deploys a thin-film of which the size of area is nearly 10 times greater than the size of main satellite.
3. Due to atmospheric drag that's created by the film, altitude of the satellite drops.
4. The satellite will be annihilated by the heat generated when it re-enters the Earth's atmosphere.

MAIN FEATURES:

- Simple structure that deploys a thin film to increase air resistance.
- Variation of films that fit from 1U size up to 50kg class of satellites.

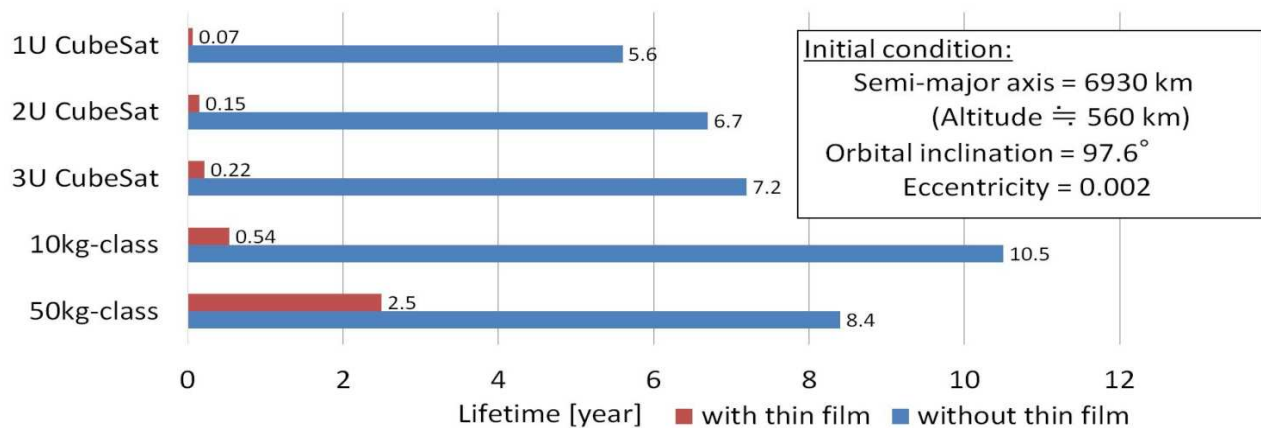


Scope of Coverage



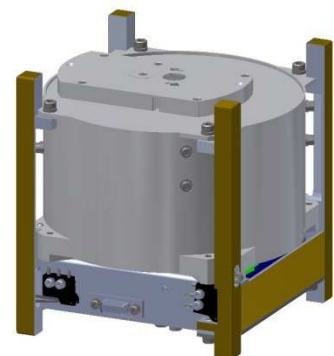
! The figures shown above roughly indicate the class and initial altitude range each size of DOM targets.
 ! Actual orbit lifetime of satellite depends on variety of internal/external factors, such as its mass, cross-sectional area, solar activity, and so on. It is always necessary to perform detailed calculation to find the most appropriate size of DOM.

Performance of DOM1500 (Result of lifetime calculation)



Records and Results of DOM activities

- DOM500 for CubeSat “RAIKO” (H-IIB, Launched in 2012)
- DOM1500 for RISING-2 (H-IIA, Launched in 2014)
- DOM2500 for Flying Laptop (Soyuz, Launched in 2017)
- DOM2500 for RISESAT (Epsilon, Launch in 2018~)
- FREEDOM Demonstration CubeSat (shown right)



“FREEDOM”

- FREEDOM, a 1U CubeSat was developed by the Joint venture of Nakashimada Engineering Works and Tohoku University for an important mission to demonstrate the actual effect of DOM in space by de-orbiting itself.
- FREEDOM was released into Low Earth Orbit from “Kibo”, Japan Experimental Module of International Space Station, on January 16, 2017.
- According to the orbit information from a public organization, FREEDOM fell under the altitude of 250 km on February 6, and is considered to have re-entered the atmosphere of the Earth approximately 1 day after.
- This result proved that DOM would function exactly as it was expected in space.

SPECIFICATION

	DOM500	DOM1500	DOM2500
Film size [mm]	500 x 500	1500 x 1500	2500 x 2500
Center cutout of film [mm]	100 x 100	500 x 500	500 x 500
Mass [g]	250	1000	1600
Electrical interface	PA connector	Micro-D connector	Micro-D connector
Resistance [ohm]	6.8	4.7 and 6.8 ※ ¹	4.7 and 6.8 ※ ¹
Required voltage [V]	5.0		
Energetic consumption [J]	5 [W] x 120 [s] ※ ²		
Deployment detection switch ※ ³	-	Insulated (when DOM is stored) Conductive(when DOM is deployed)	
Operating temperature range	-20 °C to +70 °C		
Storage temperature range	-25 °C to +80 °C		

※¹ DOM1500 and DOM2500 have two electrical circuits for redundancy. One is 4.7 ohm and the other is 6.8 ohm.

※² 5 W is an approximate value of the power consumption and 120 s is the maximum value of the time for which DOM requires a electrical power supply.

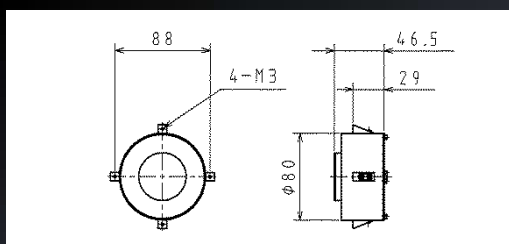
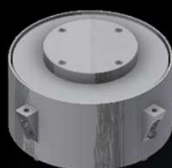
※³ Deployment detection switch is to identify whether DOM is successfully deployed or not. This switch is conductive when DOM is expanded. Otherwise, it becomes insulated.

● “DOM” and “De-Orbit Mechanism” are registered trademarks of Nakashimada Engineering Works, Ltd. effective in Japan and other countries.

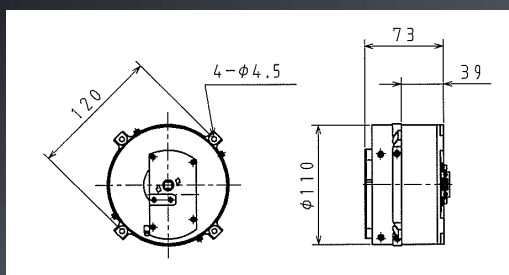
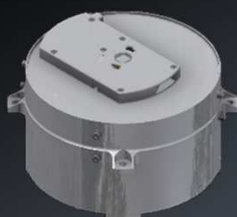
● Specifications and design are subject to change without notice.

Dimensions and Mechanical interface

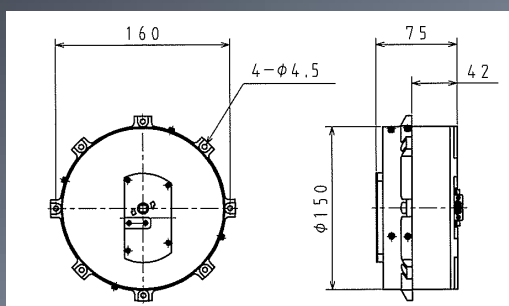
■ DOM500



■ DOM1500



■ DOM2500



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