4.7 DE-ORBITING

According to the European Code of Conduct for Space Debris Mitigation [AD 8] spacecraft in LEO should be de-orbited, i.e. allowed to fall into the atmosphere and to burn up within 25 years of mission end. In other words, the spacecraft should de-orbit to an altitude range of 500 km-600 km at End Of Life (EOL).

The space debris mitigation requirement OR-1 is wavered by DG (the Director general) of ESA, which implies that, there is no need to de-orbit at the end-of-life (EOL). Thus, there is no need of on-board propulsion system to de-orbit after EOL.

The signed Request For Wavier (RFW) is in Appendix F: Waiver- Requirement “OR-1”

Natural decay of PROBA-V from an altitude of 820 km is as shown in Figure 4-18.

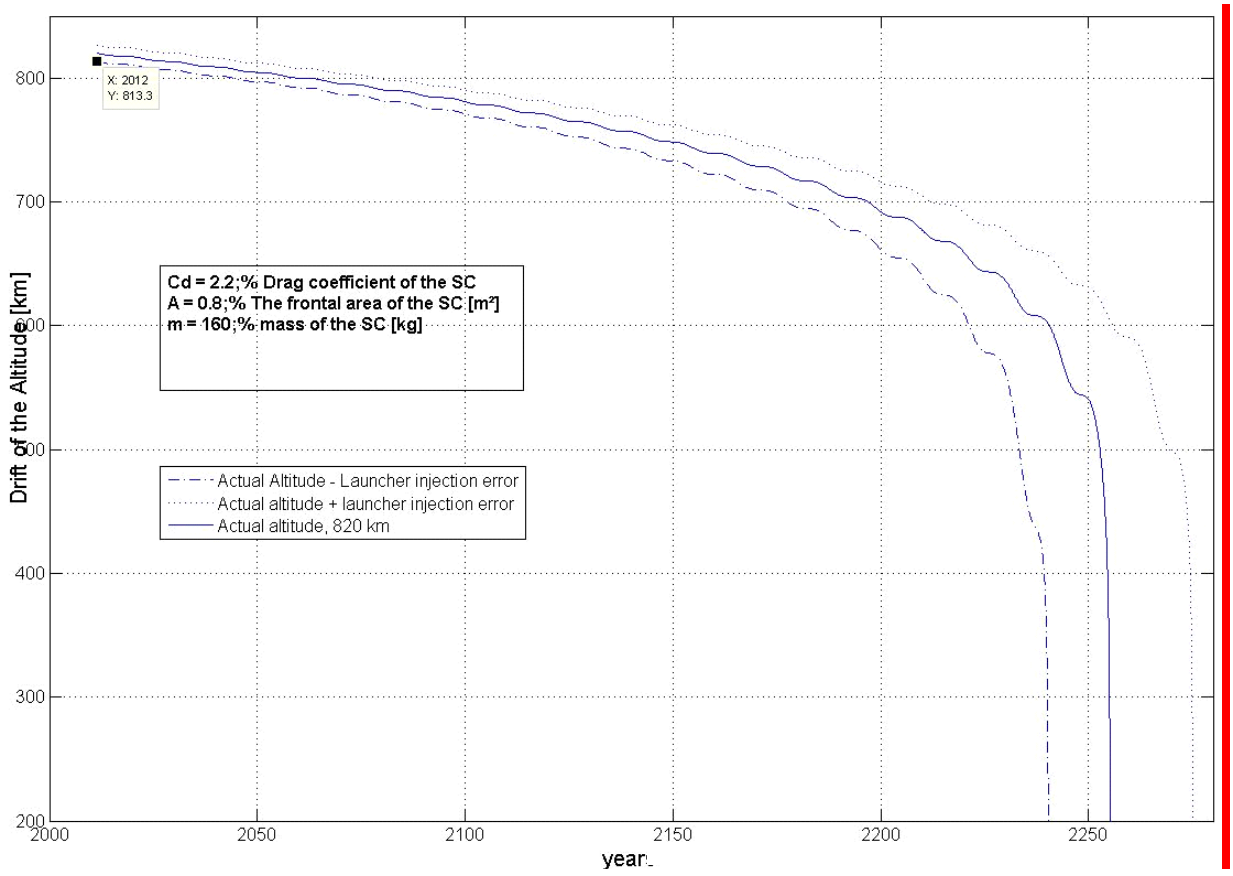

Figure 4-18: Natural decay of PROBA-V at 820 km for 250 years.

APPENDIX F: WAIVER- REQUIREMENT "OR-1"

The wavier on space debris mitigation requirement "OR-1" is approved and signed by DG (the Director General) of ESA.

esa PROBA-V

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Date: 23 March 2009
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REQUEST FOR WAIVER (RFW)

(3) Title of Waiver:
PROBA-V Disposed by re-entry within 25 Years not possible

(5) Reason for Waiver:
The present design of the PROBA-V Spacecraft, i.e. including no propulsion, does not allow the re-enter of the satellite within 25 years after the end of the mission's operational phase.

(4) Initiator-Org.:	(4a) Initiator-Name:	(6) Production affected:
ESA	K. Mellab	( ) YES (X) NO

(7) Item affected:	(8) C.I. affected	(9) Model/Version	(10) Serial #
PROBA-V Spacecraft	N/A	PFM	01

(11) BOMT. Document affected

Doc. Number:	Issue/Rev.:	Document Title:	Paragraph(s)/reqmt. ID:
Admin-ipol-2008-002E	-	Space Debris Mitigation for Agency Project	Annex 1/OR-01

(12) Other related documents affected: N/A

Doc. Number:	Issue/Rev.:	Document Title:	Paragraph(s)/reqmt. ID:

(13) Similar Previous RFW	(14) RFW affects:	(15) Class of RFW
N/A	N/A	

(16) Details:

The PROBA-V satellite baseline design does not include a propulsion subsystem and is hence not capable to perform the orbital manoeuvre necessary to re-enter at the end of the Vegetation mission, as requested by ESA Admin-ipol-2008-002E requirement OR-01.

The PROBA-V orbital parameters are:

- Circular quasi Sun Synchronous orbit with 820 km altitude and ~99 degrees inclination,
- Local Time at Descending Node (LTDN) between 10:30 and 11:30, taking into account the orbital drift during mission lifetime.

Natural orbit decay predictions from the above orbit indicate that the satellite will not re-enter the Earth atmosphere before 250 years after end of its operational mission phase. (see in annex the prediction curve of the natural decay for the first 100 years).

(17) Justification:

This Request for Waiver is justified in view of the following elements:

- Heritage of the PROBA-1 and PROBA-2 platforms.
- The PROBA_V simplified design, i.e. without propulsion, guarantees the containment of loose items and avoid risk of explosion.
- The challenging project schedule and the associated risk linked with the implementation of a propulsion subsystem on a recurring platform not designed for this purpose.
- The fact that the PROBA-Vegetation mission objectives can be fulfilled without the need for orbital maintenance.
- The increase of the platform's mass (>15%) and volume (>15%) required to perform orbital manoeuvres to re-enter the satellite from an altitude of 820km (about 100m/s required ΔV).
- The increase of mass and volume jeopardizes the possibility to identify a launch as piggyback passenger.

All other requirements from ESA Admin-ipol-2008-002E remain applicable to PROBA-V and fulfilled by the design of the flight segment.

Project	System Engineer S.Santandrea (TEC-SY)	Product Assurance	Project Manager K.Mellab (TES-SYV) F.Teston (TEC-SY)	Disposition Approved
ESA	M.Courrois (D/TEC) 27.03.09	J.Bosma (TEC-Q)	J.J.Dordain (DG) 31/04	Disposition

Figure 0-1: Approved RFW on requirement "OR-1"