Technology Website Article Template

ANNEX 1 – ARTICLE HEADER INFORMATION

Official Activity Title:	Validated reliability based models for EoL operations

Programme:	TRP	Achieved TRL: 3	
Reference:	TQQD-SOW- 013688	Closure: 2021	
Contractor(s):	Thales Alenia Space (FR)		

Contract Number:	4000129786/20/NL/AR			
Further TRL info:	Initial:	2	Target:	3
Budget (incl. CCNs):	ESA:	400 k€	Co-funded:	0 k€
Competence Domain:	All since PA/QA/Safety			
Technology Domain:	TD25 Quality, Dependability and Safety			
Service Domain:	All SDs			
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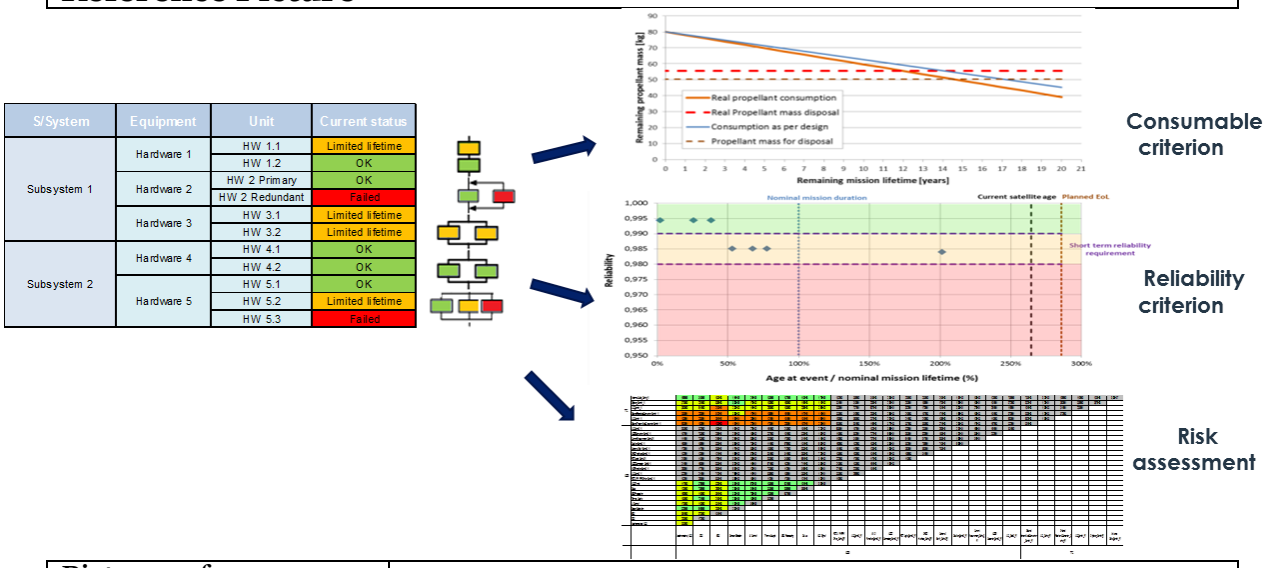
Industry Point of Contact: Name, Establishment, and e-mail	Lorenzo Bitetti (Quality Assurance / RAMS) lorenzo.bitetti@thalesaleniaspace.com			

ANNEX 2 – ARTICLE

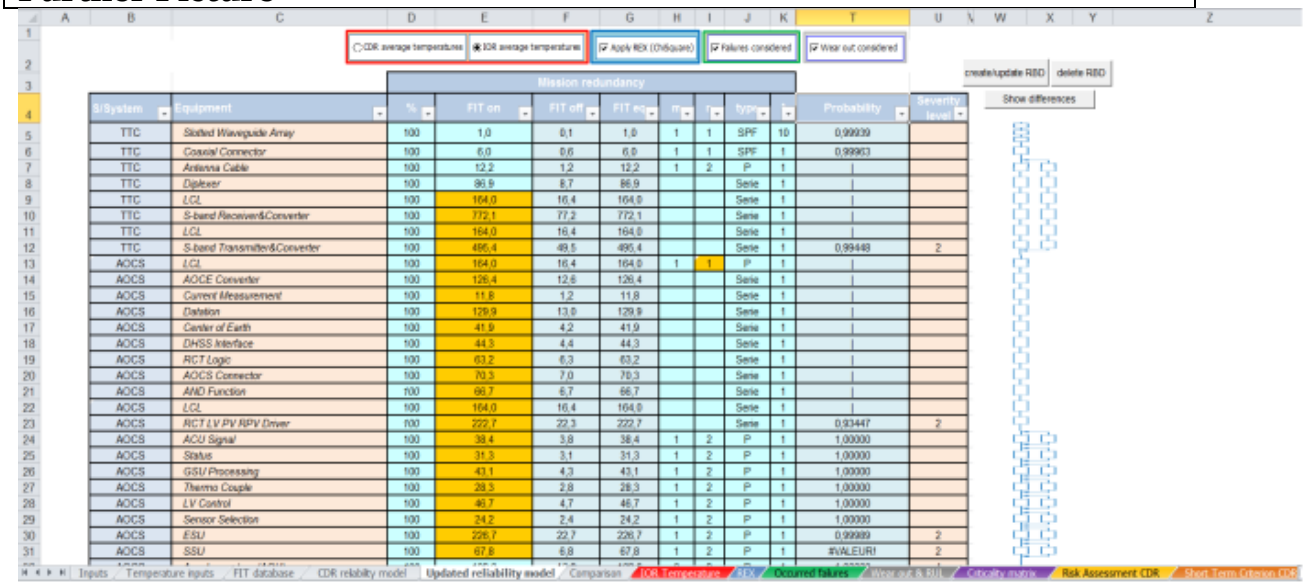
Article	
Background and justification *Max. 75 words*	Spacecraft that survive their nominal mission lifetime are generally proposed for a mission extension to maximize their return on investment. The current criteria supporting mission extension decision, are mainly based on consumables (e.g. remaining propellant) and basic operational considerations. Nowadays there is an ever increasing pressure to comply with Space Debris Mitigation regulations since the population of space debris is expected to grow, especially because of expected large constellations. Some improvements are therefore needed in order to be able to dispose the satellite in a reliable manner and especially at the right time.
Objectives *Max. 75 words*	The objectives were to develop, validate with in-orbit data and integrate improved reliability approaches enabling a more accurate quantitative risk assessment, as well as to define a concept of operation for the application of RAMS analyses and criteria for the EoL decision.
Achievements and status *Max. 150 words*	A generic reliability model has been implemented in Excel in order to support/apply the following approaches: the Health Monitoring on real operating conditions (e.g. temperature), the update of the model according to current performance and margins of units as well as the occurred failures; the return over experience; the prognostic and the Remaining Useful Lifetime (RUL) of units; and finally the enhanced risk assessment analyses. In addition, new RAMS criteria enabling a better risk-awareness decision on EoL of satellites have been evaluated and recommended: in particular a short term reliability criterion and some risk aspects.
Benefits *Max. 50 words*	The proposed approaches and tool allow for a better risk-awareness decision on the End of Life and could ideally lead to a high Post Mission Disposal success rate in the future. This has been demonstrated also via the practical and operational use of these RAMS approaches for the End of Life review of real missions
Next steps *Max. 50 words*	Some future improvements are recommended for the gaps and promising approaches identified here. Among others to apply these RAMS approaches on current and future satellites, to finalize the selection of the RAMS criteria, including their validation on previous/on-going missions; to further evaluate appropriate approaches for 'New Space' missions and constellations; and to further evaluate the prognostic approaches, and especially those based on data trend analysis which has been seen as very promising.

ANNEX 3 – PICTURES

Pictures
Reference Picture



Picture reference:	1
Short caption:	**Overview of the decision-making process for the EoL**
More detailed description:	
Credits:	
Further Picture	



Picture reference:	2
Short caption:	**Generic reliability tool supporting End of Life decision**
More detailed description:	
Credits:	

ANNEX 4 – RELATED CONTENT

Related Content	
Related links:	Enter below any links related to this project, e.g. links to web pages outside the ESA portal. A short title for the hyperlink needs to be provided.