Satellites operating beyond nominal End Of Life

Many satellites can be operated safely past their original design life and we are seeing an increasing number of satellites who are able to do so.

From an insurance point of view, the key risk elements are the following:

i) Electronic equipment operated beyond its 'bathtub' constant failure rate life
ii) Other equipment subject to wear-out or otherwise with Limited Life
iii) Total dose radiation
iv) Fuel Depletion

Due to (i) it is generally not possible to obtain coverage for equipment which does not have redundancy remaining at End Of Life; i.e. Single Point Failures are rarely insurable. With remaining redundancy, a suitable loading will be applied to cater for the higher /unknown risk this represents.

With respect to (ii) it is often possible to demonstrate that the satellite is likely to successfully extend its lifetime by comparing actual life/actuations etc. with the design limit and/or qualification limit.

With respect to (iii), estimated actual total dose should be assessed and compared with the qualification total dose for the most sensitive equipment on the satellite.

To enable insurers to assess these elements, we kindly ask you to provide some more details on this.

Limited Life Items

Please provide a list of those equipments which are subject to wear-out due to actuations, cycles, space environment and/or other aging effects. Examples would be reaction wheels, thermal covering, mechanisms, tanks etc.

For each item on the list, please indicate the expected number of cycles/actuations/age parameter for the 15-year design life, the estimated actual current number of cycles and the number of cycles/actuations/age parameters demonstrated through the qualification.

For each of the items, indicate the expected number of cycles/actuations/age parameters under the current operating conditions, one calendar year after

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proposed policy inception.

Typical examples of table requested:

Equipment	Life Limiting Factor	Design Limit	EOL Status	Qual Demo	Expiry Status
Biprop Thruster	Actuation	75,000	56,123	112,500	63,321
SADM	Rotations	6,500	5,478	9,750	5,840
Battery Cell	Charge Cycles	1.500	1,230	2,250	1.315
etc.					

Total Dose

Please list the 3 most critical equipments with respect total dose and for each of those 3 equipments provide an estimate of

(i) the total dose received at inception of the proposed policy; and
(ii) the total dose received at expiry of the proposed policy; and
(iii) the total dose to which the equipment has been qualified.

Propellant gauging method

Please describe the method(s) used for propellant gauging and the estimated uncertainty of each method.

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