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INTER-AGENCY SPACE DEBRIS COORDINATION COMMITTEE

IADC Recommendation

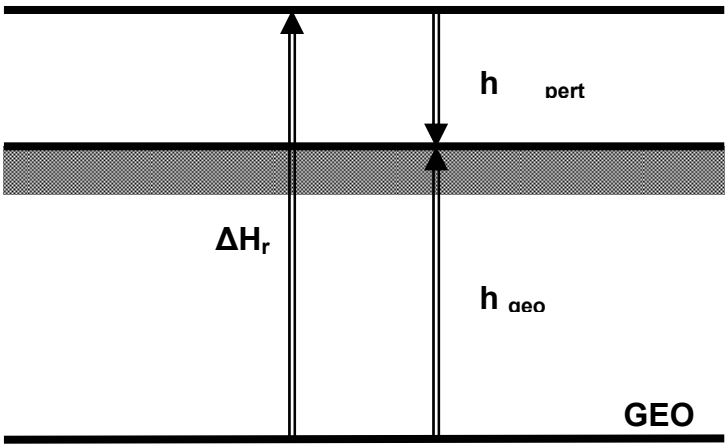
Reorbit Procedure for GEO Preservation

Issued by WG4

GEO PROTECTION
(Action Item 12.6)

1. Basic Requirement

1.1 Definition



ΔHr = altitude increase in GEO plane of reorbited S/C
h pert max = max descent of reorbited S/C due to perturbations
h geo = minimum altitude of space above GEO which is to be protected

Basic Requirement:

$$\Delta Hr - h\ pert\ max \geq h\ geo$$

1.2 Recommendation:

h geo = 200 km

2. Determination of ΔHr min

$$\Delta Hr\ min \geq 200\ km + h\ pert\ max$$

2.1 Definition

$$h\ pert\ max = h1 + h2$$

h1 = luni-solar and geopotential perturbations
h2 = k x Cr x A/m = solar pressure perturbations

2.2 Recommendation

h1 = 35km (in disposal orbit)
k = 1000
Cr = 1.0 to 2.0 depending on S/C
A/m = 0.01 to 0.10 depending on S/C

$$\Delta Hr\ min \geq 200 + (45\ to\ 235)\ km$$

or

$$\Delta Hr\ min \geq 245\ to\ 435\ km$$

depending on S/C:

- S/C operator to apply the appropriate values for Cr and A/m depending on the S/C characteristics
- S/C operator to assure availability of necessary propellant at end of mission

2.3 Margin

It is encouraged to add a margin to the above minimum value in order to reduce the effect of orbital determination inaccuracy, execution errors and possible S/C deterioration and break-ups.

3. Recommended guidelines for implementation

- Use multiburn procedure
- Raise perigee to minimum altitude
- Increase semi-major axis without decreasing perigee by using remaining

propellant and, maybe, pressurants

- Passivate reorbited S/C

4. Proposal for IADC recommendation consuming the disposal of GEO S/C at end of mission (Action Item 12.6)

- S/C in GEO shall be transferred to a higher altitude at the end of their mission in such a way that the reorbited S/C – taking into account its physical characteristics and the perturbations to which it is subjected – never comes closer to the GEO than 200 km.

- The minimum altitude above GEO to which the S/C shall be transferred shall be calculated applying the formula

$$\Delta Hr\ min \geq 235 + 1000 \times Cr \times A/m\ (km)$$

where Cr is the BOL reflectivity coefficient and A/m the aspect area (in m^2) over dry mass (in kg) ratio of the re-orbited S/C.

- The S/C operator/designer shall apply the appropriate values for Cr and A/m depending on the characteristics of the S/C.

- S/C operators/designers are encouraged to add a margin to the above minimum altitude raise in order to reduce the effect of orbital determination inaccuracy, execution errors and possible S/C deterioration and S/C break-ups.

- The S/C operators/designers shall assure availability of the quantity of propellant necessary for the altitude raising at end of mission.

- As a guideline for the implementation of the orbit raising manoeuvre, the S/C operator shall:

  - Use a multiple burn procedure to raise perigee to the projected minimum altitude

  - Increase semi-major axis without decreasing perigee using remaining propellants and, if feasible, pressurants

  - Passivate the re-orbited S/C by removing all energy remaining on board."