

Mission Extension 2015-2016

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➤ **MEOR (Jun 2012)**

The INTEGRAL payload, platform and ground segment continue to perform well and are expected to be able to provide the necessary science performance to beyond the end of the extension interval.

➤ **AWG (Oct 2012)**

All four proposed mission extensions were considered to be of high scientific merit and worthy of extension. The AWG ranked the proposals as follows: 1) XMM-Newton, 2) ESA contribution to HST, 3) Planck-LFI, and **4) INTEGRAL**.

➤ **SSAC (Oct 2012)**

- Category 1 (Maximum loss): Cassini, HST, XMM-Newton
- Category 2 (Serious loss): Cluster, Hinode, Mars-Express, Planck-LFI
- Category 3 (Loss): **INTEGRAL**, PROBA 2, SOHO, Venus-Express

➤ **SPC (Nov 2012)**

Approved the operations of Cassini-Huygens, Cluster, Hinode, HST, **INTEGRAL**, Mars Express, SOHO, Venus Express and XMM-Newton from 1 January 2013 to 31 December 2014.

Indicative decision for 2015-2016 in mid 2013, based on Level of Resources set by Ministerial Council.

➤ **Ministerial Council (Nov 2012)**

Approved 'flat' budget, i.e., without inflation correction.

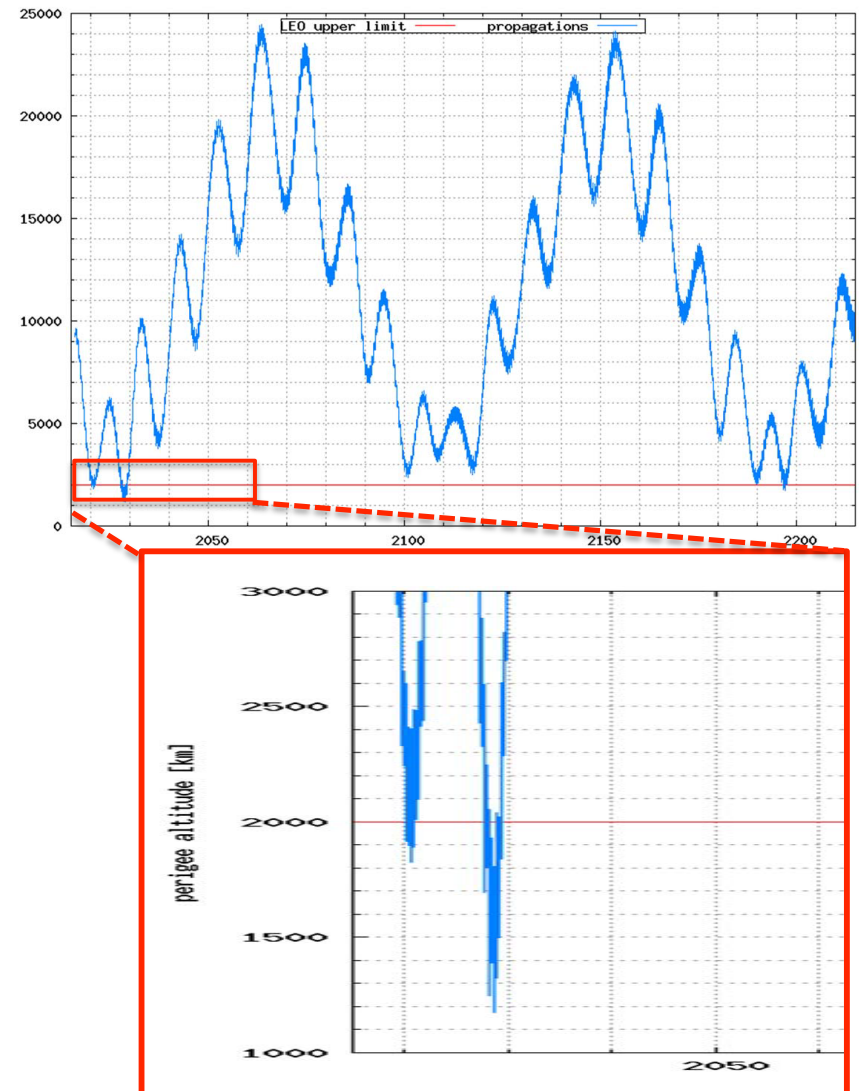
- ➔ No immediate budget problem in 2013, but increasing shortfall in future, depending on inflation.
- ➔ Assigned envelope for mission operations not sufficient to extend all missions as proposed.

- **All missions, regardless of ranking** requested to look into operational or post-operational saving options, **including options significantly affecting scientific performance** (lean missions → no easy cuts).
- Attempt to arrive at overall package, across boundaries of missions and research areas.
- Detailed process currently being defined. Saving options and trade-offs for individual missions will be presented for comments to User Groups in time before presentation to Advisory Structure.
- First meeting with SRE-O management on INTEGRAL costs: 24 Jan 2013.

LONG-TERM FUTURE: DE-ORBIT INTEGRAL?



- *Preliminary* analysis by Flight Dynamics:
 - INTEGRAL will not de-orbit naturally.
 - But will pass through protected LEO zone (<2000 km) in 2020 and 2029.
 - Also will cross protected GEO region in future (2040ff).
 - Permanent raise of perigee height above 2000 km seems to be infeasible.
- Choice between space-debris, impinging on protected regions, and controlled re-entry in 2019/2020 (or ~10 y later).
- Full FD analysis ongoing, results expected in February.



- **At current fuel consumption**, controlled re-entry implies:
 - Critical manoeuvre in 2016 (TBC) and afterwards no remaining fuel for science operations (rest needed for final de-orbit).
 - FCT and reliable control environment is to be maintained at ESOC, regular contact with satellite for monitoring of health.
- Possible strategies to reduce fuel consumption:
 - Relax constraints on reaction wheel speeds (as done for XMM-Newton)
➔ Expected savings of $\geq 20\%$ with no further impact.
 - Avoid use of special perigee attitudes for SPI ➔ no problem up to 2018.
 - New observing strategies optimizing movements???
 - 4 wheel drive implementation for INTEGRAL (as for XMM-Newton)
➔ very interesting option, but would mean significant extra cost.

4WD OPTION



- More flexible handling of reaction wheel speeds and bias sequences.
- Potential fuel savings of $\geq 50\%$!
- **But** additional costs of $>1\text{MEuro!}$ (TBC)
- Different scenarios for re-entry under study.

