

# XMM-Newton Mission Status



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European Space Agency

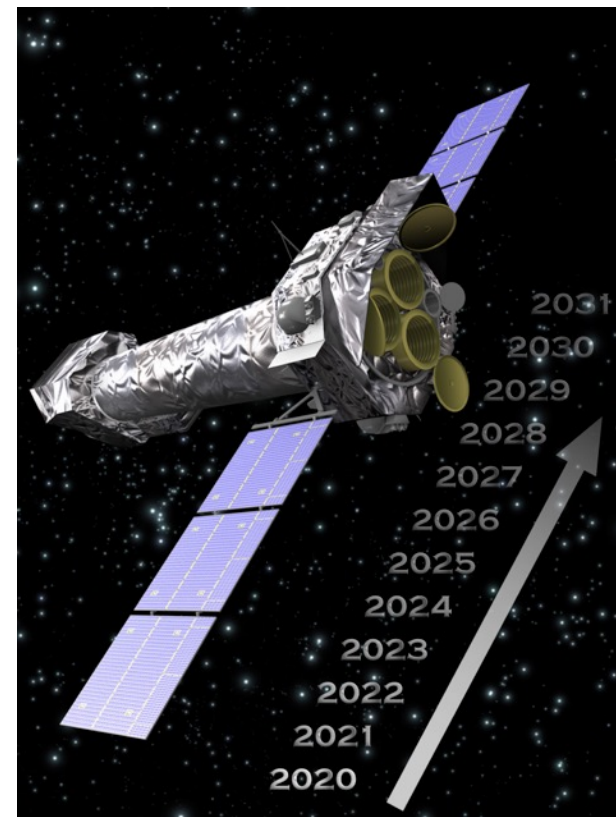
# The spacecraft continues in great shape

- ✓ All instruments in same general shape as last year. No major incidents.
- ✓ Successful fuel replenishment operations in 2020 & 2022. **2023 fuel replenishment on 22–26 May.**
- ✓ At the moment, no active collision avoidance monitoring necessary, next time from 2027 onwards. Spacecraft Debris Office still monitors routinely.

Need to keep an eye on long-term degradation of some components (⇒ Presentation to XUG 2021).

**But no major worry known.**

- ➔ Continuing to look ahead to science operations well into 2030s!



# A lot of progress in the Ground Segment

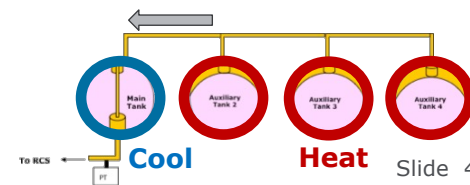
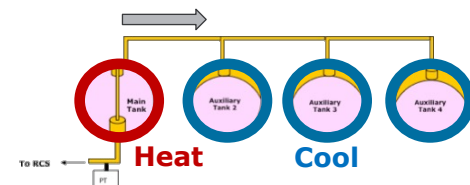
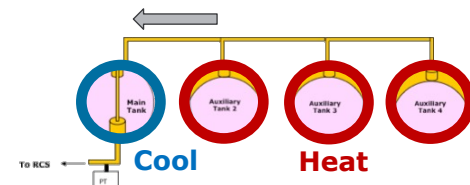
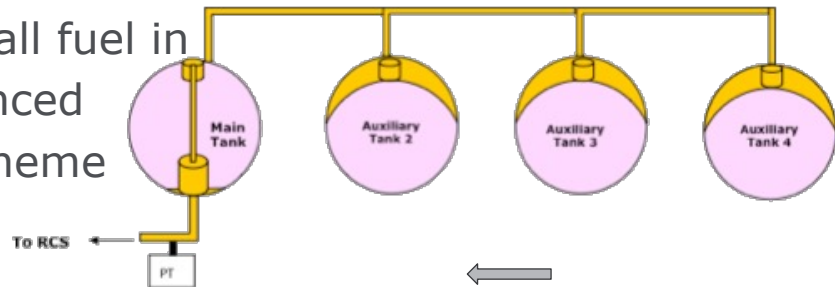


- Upgraded proposal tools
- Many systems modernised
- SAS release, including ESAS
- ARES trend analysis becoming operational
- Clarifying way forward for operational DB replacement at MOC



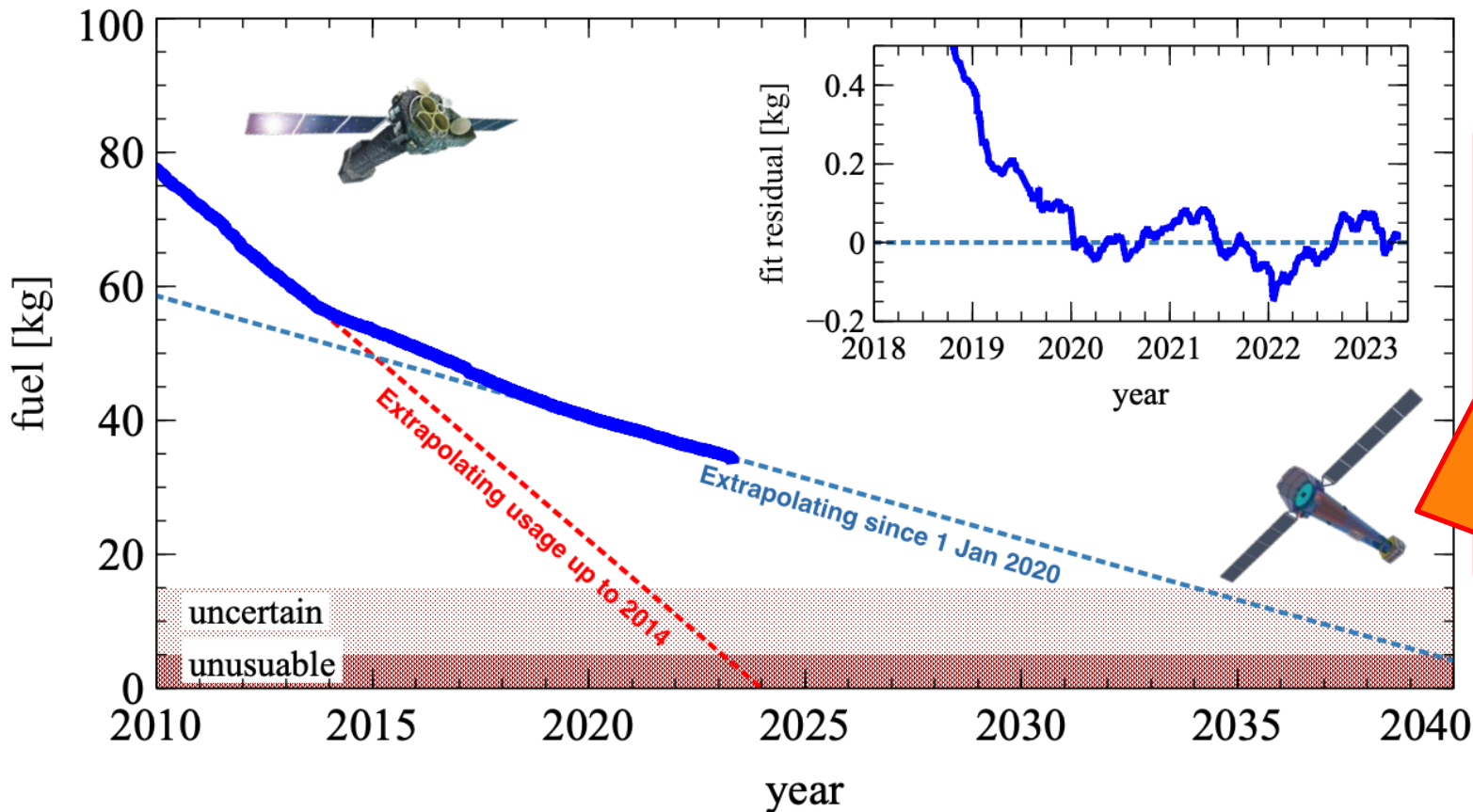
# Maximising lifetime by fuel replenishment

- Only main tank connected to thrusters, not all fuel in auxiliary tanks directly useable. Fuel rebalanced by special heating and cooling of tanks – scheme developed 2012-2016 between industry and ESOC team.
- ➔ First **fuel migration**: lower main tank temperature for gas pressure gradient.
- ➔ **Since 2020 fuel replenishment**: heat main tank to expulse gas from it, then replace by fuel from auxiliary tanks, requires large temperature gradients.
- First replenishment during COVID19 lockdown, now slowly becoming yearly 'routine' – but remain critical.



Slide 4

# Fuel usage allows for lifetime clearly >2030



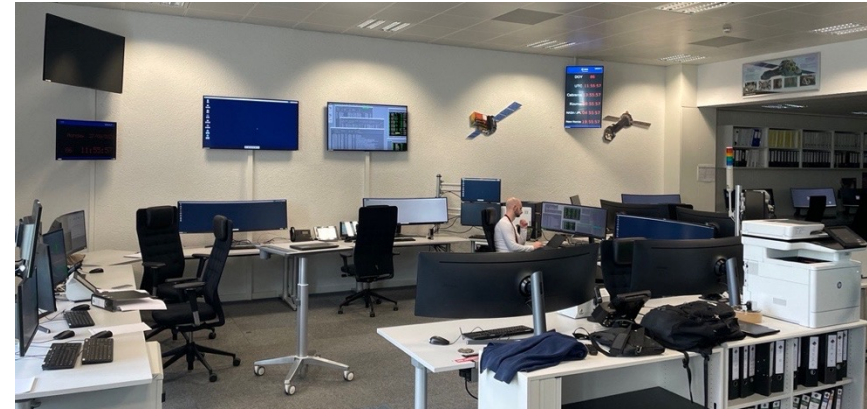
Systems and operations **must** be future-proof!

# Rejuvenating systems & operations – MOC

- Hardware and operating systems brought up to date, while maintaining 24/7/365 operations.
- Further automation, e.g., for Ground Station operations or radiation protection. *Continuing*
- Control room upgraded to handle 4 missions (XMM-Newton, INTEGRAL, Gaia & Euclid) concurrently with joint spacecraft controllers. *Done*
- Mission Control System migration. *Fully underway*

*Regularly*

*Continuing*



# Rejuvenating systems & operations – SOC/MOC



- Virtualization of RGS on-board software server.
- Further automation of operational tasks like instrument recovery after problems.
- Migration to ARES system for instrument trend analysis and possibly more.
- Change to new database system (DABYS) for operational database at MOC, adaption of interface processes at SOC.

Done

Continuing

Fully underway

Seriously  
starting  
after  
investigation



# Rejuvenating systems & operations – SOC



- Hardware and operating systems brought up to date, while maintaining mostly continuous operations and upgrading software.
- Automation of raw data ingestion and quality checks.
- Updated proposal handling software for Phase I and Phase II.
- Move to use of Python for scripting and visualization in science analysis software and enabling analysis within Datalabs.
- Automated ingestion of delivered catalogues into XSA.
- New XSA frontend software.
- New Helpdesk.

Continuing

Mostly done

Done for I,  
finalising for II

Continuing

Mostly done

Continuing

Underway





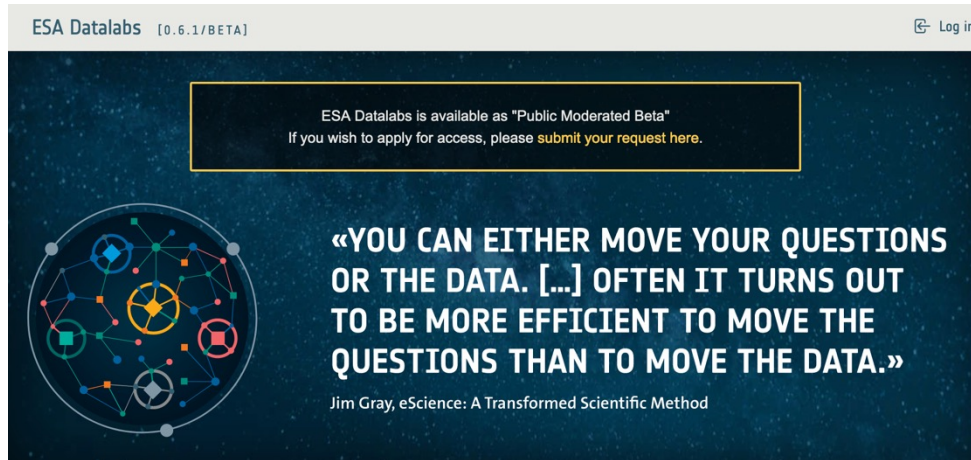
# Going further in rejuvenation – SOC

- New, improved systems to develop and build operational and science analysis software.
- Enhance interactive science analysis in Datalabs, with help of YGT.
- Investigation of Machine Learning or Artificial Intelligence Methods in operations and data analysis.

Started

From fall  
onward

Preparative  
first steps



# Added complications



- Building B renovation ➡ move of Control Room to C building with major effort.
- 19 + 20 Dec 2022: general network problems at ESAC severely affected XMM-Newton (and Gaia) operations. Significant work to get all back in shape.
- Annoying small data losses between MOC and SOC took a while to be resolved by changed configuration of IT systems.
- Pipeline system wiped out end March 2023 by human error of IT services; restore from back-up not working as expected ➡ Complex recovery until mid April, then catch-up. System now made more resistant against human error.

# Situation clearing up somewhat

- Slightly improved overall financial situation.
- SPC approved extension of operations until **end 2026** and indicatively until **end 2029**.
- **But ...**
- Continued pressure to keep costs in check or reduce further, despite inflation.
- New ESA-wide frame contract (EFC3) from 2025 onward.
- ESA staff retirements on the horizon

# Goals and challenges for the future

**Long-Term:** plan for graceful winding down; ensure continued support well beyond life-time

... besides keeping things going as well as always

**Mid-Term:** deal with new contract and retirements; further rejuvenation; push for 'smart' operations; keep attractive for new users

**Near-Term:** stabilize *all* systems; complete on-going rejuvenation

# Visions for the 25th launch anniversary



All computers  
up-to-date and  
easy to maintain

**Celebrate  
25 years of  
success!**

All data  
reprocessed in  
improved pipeline

Rejuvenated  
Operational DB  
set-up MOC/SOC

5XMM catalogue  
released in new  
XSA interface

Improved  
Instrument  
Monitoring based  
on ARES

Wider user base by  
simplified access to  
science analysis

