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XMM-NEWTON'S REACTION WHEELS RE-LUBRICATION ACTIVITIES

Abstract

ESA's XMM-Newton space observatory, the flagship of European X-ray astronomy, is after its launch in 1999 the most powerful X-ray telescope ever placed in orbit. The mission originally designed for a 10 years lifetime is planned to be operated long into this decade since spacecraft and instruments are operating admirably without major problems. The most significant degradation was noticed since summer 2008 when one of the reaction wheels started to show an anomalous behaviour: the current of RW1 sometimes during stable pointing had a jump, with increased value of drawn current. After some investigation it was recognized to be the well-known problem of cage instability of the bearing. Later on also the RW2 showed the same symptoms. The only possible cure or mitigation to this problem is a re-lubrication of the ball bearing of the reaction wheel. Re-lubricate the bearing in flight is possible thanks to the design of an oil reservoir placed in the proximity of the ball bearing. In December 2011 it was decided to switch the RW1 off to avoid further degradation of the bearing, reconfiguring the AOCS with RW 2-3-4, and on 12 November 2012 the bearing was re-lubricated for the first time with a special procedure. Since the cage instability appeared again after few days a longer re-lubrication was attempted on 27 November 2012. This second re-lubrication was not conclusive, since another event of cage instability occurred during the following month. On 18 December 2012 was decided to switch off again the RW1, to be on the safe side. At the same time a re-lubrication of RW2 was performed. This paper describes the challenges of the operations carried out to re-lubricate twice the bearings of RW1 and once the bearing of RW2 and the outcome of such operations.