

## ASTRODYNAMICS SYMPOSIUM (C1)

## Attitude Dynamics (1) (8)

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## FIRST IN-ORBIT RESULTS OF THE PLEIADES CMG-BASED ATTITUDE CONTROL SYSTEM

**Abstract**

On December 17th 2011, the first Pléiades satellite was launched from Kourou spaceport by a Soyuz rocket. Pléiades is the highest resolution civilian earth observing system ever developed in Europe. This imagery program is conducted by CNES, the French National Space Agency. Astrium is the prime contractor of the satellites. The Pléiades program implements a new class of optical observation system, characterised by high imaging performances such as sub-metric resolution, 20km swath, large acquisition capacity, and very high pointing agility. The main feature of the Pléiades Attitude Control System (ACS) designed by Astrium is to implement for the very first time in Europe a new type of actuator: a cluster of 4 Control Moment Gyros (CMGs). The use of CMGs allows the high agility performance required to fulfil the very demanding imaging needs. The new non-linear iterative guidance algorithm operating a CMGs system is completely different from the classical guidance system with reaction wheels. The Pléiades high-accuracy geo-location is ensured by a set of 4 fibre-optic gyroscopes and 3 star trackers to provide attitude measurement accuracy. Orbit determination and time tagging are calculated onboard with metric accuracy by the Doris navigator, taking into account the attitude of the satellite. The in-orbit acceptance tests demonstrate that the performances are above the expectations. The paper will give a status of the Pléiades pointing performance observed in flight, and will focus on the in-orbit validation of key technologies developed specifically for this satellite by Astrium, such as the Control Moment Gyroscope, the Astrix200 high performance FOG gyroscope and the micro-vibration dampers.