ATTITUDE MEASUREMENT AND CONTROL

- Pre-operational requirements :
  - remove initial precession & nutation
  - point the spin axis within 1° of orbit normal
  - spin the satellite up to 120 rpm
- Pre-operational actuators consist of four 20mN Nitrogen thrusters; 1.8 kg propellant required for rate damping (0.8 h) and spin-up (5.5 hours)
- Operational requirements:
  - control phase lag between S/C and PGB to $< 10^{-2}$ rad
  - measure spin rate with RMS($\Delta\omega/\omega$) $\leq 10^{-4}$, equivalent to a phase lag of 0.035° (drag free control)
  - measure absolute orientation of spin axis and Earth direction with $\Delta\theta < 6 \cdot 10^{-3}$ rad (0.35°)
- Momentum bias of 400 Nms provides gyroscopic stability against torques
- Earth sensor provides sufficient measurement accuracy (bias 0.05°, 3σ random error 0.01°)
- Differential spin rate control based on passive compensation mechanism (90%) and FEEP (residual 10%). Spin controller works on light-emitting diode signals (10 μm resolution over 30 cm = 43 arcseconds)