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This paper presents the mission, spacecraft and subsystem design of a Near Earth Asteroid Sample Return Mission developed by the EADS Astrium team and funded by the European Space Agency.

Asteroids are of great interest because they can provide invaluable insight into the history and formation of the solar system. Study and knowledge of their properties is also vital for the mitigation of any Earth impact threat. Near Earth Asteroids (NEA) are the most easily accessible objects and therefore the best candidates for a cost effective sample return mission.

The key scientific objective of the mission is to return a significant amount (100-300g) of pristine unaltered asteroid material. In addition remote sensing instruments are used to characterise the mass properties, geometry and topology of the asteroid, to select the landing site, and to provide contextual information on the sampling site.

The baseline mission design presented is for a low cost short duration mission to the C-type asteroid 1999JU3 launched on Soyuz Fregat. Chemical propulsion is used for both the outbound and return transfers with the outbound propulsion stage being jettisoned at the asteroid and a combined lander/ Earth Return vehicle providing the required propulsion for landing, ascent from the asteroid, and return to Earth.

Following the separation of the propulsion stage the science phase starts with at least 3 months of orbit characterisation prior to landing site selection. The sample is collected during a short landing period, sealed in the sample container to prevent contamination and transferred to the Earth Re-Entry Capsule (ERC). After the return transfer to Earth the ERC is ejected and delivers the sample container safely to the ground through a spin stabilised hyperbolic trajectory.

The mission and spacecraft design presented for 1999JU3 provides a robust and flexible NEA sample return concept. The preliminary analysis presented shows that the concept can be easily adapted for a number of NEA targets providing multiple mission opportunities within the 2015-2020 timeframe.