

Charming Asteroids & Comets - The HUMMINGBIRDS/CHARM (HC)  
Asteroid/Comet Engineering Science Service (ACCESS) Missions  
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A concept is described for multiple missions that will intercept and "interview" target NEOs/NEAs. The "charming" aspect of this concept is the requirement that we send a minimum of 2 vehicles to each target. A Charm is a gathering of Hummingbirds. The HC missions are intended to meet the clear guidance driven by the NEO/NEA communities; "Observe & Touch" and provide this capability "Early & Often". There are several excellent mission concepts coming forth to meet the remote "observational" need, for example NeoCAM and NESS. The HC missions are intended to meet the "tactile", "touch" component. "Early" and "often" drives the need for Overwhelmingly Cost Effective (OCE) systems requiring simplification and reduced complexity and necessitates that there need be a "many-off", production mode approach implemented in spacecraft design, build, and availability. HC is highly motivated by the concept of providing a "service" to the NEO/NEA communities. HC enables unique opportunities at each target in providing complete characterizations of target properties. Each "charm" includes a Touch & Go vehicle (TAG) that "flits" in close to the target and provides up-close visual and tactile data along with an Observer/Communications (ObsComm) vehicle that relays both TAG and ObsComm video along with instrument data streams from both vehicles. Modern technologies in avionics for spacecraft control, communications, and navigation permit the Hummingbird to be small enough that multi-spacecraft missions can be launched on the more moderate-sized rockets. Since the Hummingbirds vehicle designs are identical, no redundancy is implemented in their design, thus reducing the cost of implementing that complexity. The complete application and advantages in using Hummingbirds/Charm concept in small body missions are covered in the paper.

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