# Mission Lifetime

A critical component for any proximity operations mission is mission lifetime; specifically the maximum elapsed time during which the mission can be accomplished. Historical data shows that rendezvous missions are typically short or fail, with the best example being Surrey Satellite Technology Ltd’s microsat SNAP-1. SNAP-1 was intended to rendezvous with the Tisinghua-1 microsatellite after deployment from the launch vehicle’s upper stage. Though SNAP-1 carried 600 m/s in delta-V, it was not able to neutralize its velocity relative to Tisinghua-1 before the spacecraft were too far away to rendezvous. Their closest proximity was slightly less than 2000 km roughly 1.5 years after launch.

Orbital analysis corroborates the conclusion that relative velocities must be neutralized quickly after separation for rendezvous to be possible. Separation velocities of 5cm/s, 10 cm/s, and 50 cm/s were considered, as well as factors from the low Earth orbit environment such as atmospheric drag and solar radiation pressure. The analysis concluded that a separation velocity greeter than 5 cm/s would result in the two Rascal spacecraft being greater than 50 meters apart after just one orbit.

Based on the historical data, the preliminary orbital analysis of the separating spacecraft, and the time that may be required to contact and checkout the spacecraft after deployment form the launch vehicle, a mission lifetime of six months was selected.