

Rascal

Mission Overview Document

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# Executive Summary

Rascal’s mission is to demonstrate proximity operations within a small satellite architecture, including stationkeeping, “Escape”, and rendezvous.

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# Program Introduction

Rascal is a spacecraft mission that seeks to demonstrate the performance of in-orbit proximity operations within a small spacecraft architecture. Proximity operations are defined as the performance of orbital maneuvers, such as Stationkeeping, Rendezvous, and Collision Avoidance, relative to a resident space object (As Defined in Table 1-1).

**Table 1-1. Key Proximity Operations Definitions**

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| --- | --- |
| **Proximity Operation Terms** | **Definition** |
| Stationkeeping | Maintaining a set relative displacement between two space objects for a period of several orbits |
| Collision Avoidance | Performing an orbital maneuver that increases the relative displacement between two space objects, as to avoid on-orbit collisions and potential orbital debris creation. |
| Rendezvous | Performing an orbital maneuver that decreases the relative displacement between two space objects within a set distance for a period of several orbits. |
| Resident Space Object | Any satellite or object residing in space |

Proximity operations have been designated by the NASA Innovative Advanced Concepts (NSPIRES) program as one of many transformative ideas that will help enable new aeronautics and space systems capabilities[[1]](#footnote-1). If successful in demonstrating the performance of such operations, Rascal would act as a stepping stone to future development and refinement of the technologies and processes involved with the performance of proximity operations, potentially leading to the creation of small satellites that are capable of inspecting, or even repairing, damaged satellites or crew capsules, saving millions of dollars and man hours associated with the replacement of said systems that would normally have no cost-effective means of being repaired in-orbit.

This document serves to elaborate on the relevance and feasibility of proximity operations demonstrations for small spacecraft from historical, analytical, and operational perspectives, as well as outline the mission requirements, success criteria, and design flow-downs for the Rascal mission itself.

# Mission Objectives

1. Weaver, David. "ASA Continues Implementation Of 2010 Authorization Act Program Offices, New Technology Solicitations Announced." *NASA*. NASA, 01 Mar. 2011. Web. 06 Dec. 2013. <http://www.nasa.gov/home/hqnews/2011/mar/HQ\_11-057\_Program\_Offices.html>. [↑](#footnote-ref-1)