# Development of an Interchangeable End Effector Mechanism

1 inch

# Note this is bold 12 point text for the Ranger Telerobotic Vehicle

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## (NOTE there are two single spaced lines between authors and “Abstract”)

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## Abstract

This is 10 point Arial text with line spacing set to at least 12 point. The Ranger program at the Space Systems Laboratory (SSL) at the University of Maryland is a demonstration of an extremely low cost space flight experiment. The Ranger vehicle is designed to perform teleoperated spacecraft maintenance. Completing the various tasks included in spacecraft maintenance requires several specific tools. This paper describes the Ranger interchangeable end effector mechanism (IEEM). Its design allows Ranger to change end effectors to utilize the appropriate tool for the various tasks.

1 inch

## Introduction

For many years, the SSL has studied how to do useful work in space with a particular emphasis on neutral buoyancy simulation of the microgravity environment. The primary approaches are to understand how a person performs useful work in weightlessness, how machines operate in weightlessness, and how the two can work together. Neutral buoyancy was chosen as the weightless environment simulation for the Ranger program. This environment allows motion in all 6 DOF, but also introduces some new challenges.

### Subheadings are Underlined

The SSL has developed several telerobotic systems for operations in the neutral buoyancy environment. The Ranger neutral buoyancy vehicle (Ranger NBV) is the newest system to come on-line in the SSL. Ranger NBV, shown in Figure 1, is the development unit for the Ranger telerobotic flight experiment.

## Ranger Background

Ranger is a telerobot designed to perform complete, end-to-end spacecraft maintenance operations. These include rendezvous and docking with a target vehicle, performing a specified task set and departing

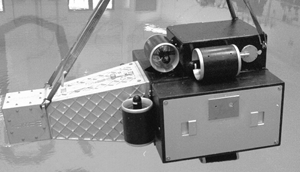


Figure 1. Ranger NBV shown being lowered into tank

1 inch



Figure 2. Latching Mechanism shown in latched position

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2. \*\* Note that this is 10 point Arial text

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