

199-22600

SUPERVISED AUTONOMOUS RENDEZVOUS AND DOCKING SYSTEMS
TECHNOLOGY EVALUATIONS*

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ABSTRACT

The Jet Propulsion Laboratory, employing the technology assessment that resulted from the "Autonomous Rendezvous and Docking Conference" held at the Lyndon B. Johnson Space Center (Aug15-16, 1990) as the basis undertook a literature search and contacts with major national and international aerospace companies to perform an assessment of the existing technologies and those that are needed to accomplish supervised autonomous rendezvous and docking in space.

The presentation will cover five issues: a) Lessons Learned, b) Technology assessment for navigation and guidance sensors for Autonomous Rendezvous and Docking (AR&D), c) Technology assessment of Guidance, Navigation and Controls (GN&C) techniques for rendezvous and docking, d) Docking mechanisms and e) Space and Ground Operations.

Although concepts for rendezvous and docking sensors, architecture, protocol and mechanism exist, the choices of demonstrated capabilities are limited. The trade analysis of software and hardware leaves a lot to be desired because of inconsistency in the data base and the simulation efforts. Current mechanism designs are targetted to manned-module docking. There is a need to achieve soft docking of a wide range of free-flying spacecraft and space-borne devices and assemblies. The need for autonomous docking has identified the need, in particular, for closer system integration of sensors and control software to make the mechanism respond to real-time relative displacement, body interactive dynamics and rate data. Neural Network offers tremendous potential for true autonomy but the technology capability need to be verified.

* This work was funded by the New Initiative Office at the Johnson Space Center (Task No. 906-00-00).