

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Future Space Transportation Systems Technologies (5)

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## ANALYSIS OF MAGLEV LAUNCH ASSIST VERSUS CONVENTIONAL ROCKET DESIGN

**Abstract**

NASA's Marshall Space Flight Center in Huntsville designed and tested a magnetic levitation (Maglev) track as a possible first stage launch assist mechanism. A Maglev system uses magnetic fields to levitate and accelerate objects along a track, which would potentially provide initial vertical velocity prior to rocket ignition and allow for smaller, lighter rockets. Previous tests demonstrated that Maglev technology could accelerate a spacecraft up to 600 mph, with a vertical component depending on the track orientation, and then switch to a conventional rocket propulsion system near the endpoint of the track. Maglev launch assist provides many advantages over the conventional rocket launch and the paper presents a system approach documenting the launch assist and compares both systems, essentially asking the question "would the investment be feasible compared to conventional solid/liquid rockets?" The paper initially presents a structural design of the Maglev launch assist track, including ideal location, length, attitude placement, and the necessary power requirements to launch large payloads. The paper then analyzes the system by considering engineering challenges of construction, maintenance and power supply. A case study is performed comparing conventional rocket launch to Maglev launch assist on the basis of payload lifting capabilities, cost and environmental impacts. The paper concludes with an overall appraisal of the Maglev launch assist.