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A TRANSPORT THEOREM FOR THE INERTIA TENSOR FOR SIMPLIFIED SPACECRAFT
DYNAMICS DEVELOPMENT

Abstract

Dynamics development for free floating bodies in space involves describing how the body moves and can be complex for multi-body systems. If the body is assumed rigid, the change in mass properties is trivial because they do not change with respect to the body. However, if this assumption cannot be made, describing the change in mass properties is critical. A key aspect of this variation is the change in the inertia tensor of the composite spacecraft. The transport theorem of vectors is widely utilized for dynamics development but is not well suited for simplification of the expression for the time rate of change of the inertia tensor. In this paper, the transport theorem of the inertia tensor is derived. A dynamics derivation is included and highlights the simplifications and time savings gained by the application of this tool.