Public Abstract
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Given recent interest in developing more cost-efficient and reliable means of launching cargo into space, it has been argued that reusable launch vehicles (RLVs) such as the Space Shuttle or X-34 require more sophisticated technology for guidance and control. The idea is that, in order to avoid as much loss of crew as possible, RLVs would be able to automatically calculate and fly a trajectory to the nearest landing site, especially in the case of an emergency (an abort during its ascent) or unexpected reentry conditions (such as extreme wind or turbulence). The Space Shuttle, once it completed the hypersonic atmospheric heating phase of reentry and regained the use of its aerodynamic control surfaces, selected from precomputed trajectories to choose an appropriate glide trajectory. This approach cannot handle suboptimal conditions outside a given range of uncertainties, so a more robust control system is desired.

A software package has been developed in this study that maximizes the range flown by an unpowered RLV during the terminal area energy management (TAEM) phase of reentry into the atmosphere, which occurs after the vehicle has completed the hypersonic reentry phase (>70,000 ft and Mach >1.5) and before it begins the approach & landing phase (10,000 ft and below). The purpose of maximizing the range of an RLV is to provide it with the greatest potential possible to safely reach a landing site. The TAEM phase has received little attention in approaches to range maximization, which is the reason for its consideration here.