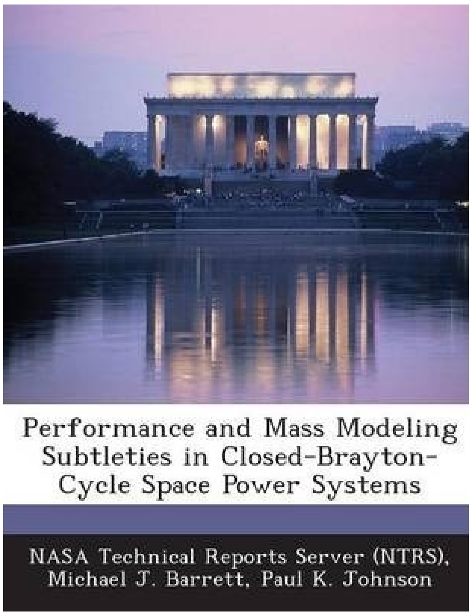

Performance and Mass Modeling Subtleties in Closed-Brayton-Cycle Space Power Systems

Michael J Barrett,Paul K Johnson, Created by Nasa Technical Reports Server (Ntrs)

A number of potential NASA missions could benefit from closed-Brayton-cycle (CBC) power conversion systems. The human and robotic mission power applications include spacecraft, surface base, and rover scenarios. Modeling of CBC subsystems allows system engineers, mission planners and project managers to make informed decisions regarding power conversion system characteristics and capabilities. To promote thorough modeling efforts, a critical review of CBC modeling techniques is presented. Analysis of critical modeling elements, component influences and cycle sensitivities is conducted. The analysis leads to quantitative results addressing projections on converter efficiency and overall power conversion system mass. Even moderate modeling errors are shown to easily over-predict converter efficiencies by 30 percent and underestimate mass estimates by 20 percent. Both static and dynamic modeling regimes are evaluated. Key considerations in determining model fidelity requirements are discussed. Conclusions and recommendations are presented that directly address ongoing modeling efforts in solar and nuclear space power systems.