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# A Computational Strategy to Assess the Damage in the Wall of a Small In-Orbit Thruster

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The wall damage of a chemical thruster for orbital positioning of small satellites is assessed using computational fluid dynamics (CFD) and structural (FEM) models. A CFD analysis with a 3D model of the thruster is used to simulate the combustion of a liquid mixture of propylene (C3H6) and nitrogen dioxide (N2O) and to calculate the spatial-temporal temperature distribution inside the thruster wall, made of PH15-5 stainless steel. Then, these results are transferred to a 3D mechanical model of the thruster for structural analysis and wall damage calculation. In the latter analysis, the material properties of the thruster wall at different temperatures and the elastoplastic von Mises criterion with isotropic hardening are considered. Finally, the results obtained from the CFD analysis with a three-dimensional model are compared with those coming from a homologous analysis with a 2D model to evaluate the accuracy of the structural analysis depending on the type of modeling used for the fluid dynamic analysis.

Keywords: chemical thruster; damage; thermal-stress analysis

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