Dynamic failure of Armox 500T steel against high-speed long-rod impact

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ABSTRACT

Numerical modeling approaches become effective engineering techniques in the field of structural-scale designs of armor systems under dynamic impact loading and a suitable material model enables to accurately reproduce experiments and investigate impact-related phenomena (i.e., change of mechanisms). In this study, the Generalized Incremental Stress-State dependent damage MOdel (GISSMO) is applied to explore the dynamic failure and fracture of Armox 500T steel under high-velocity ballistic impact by a long-rod projectile in LS-DYNA explicit solver. The Johnson-Cook model is used to describe the behavior of the tungsten heavy alloy projectile and the GISSMO is employed to describe the stress state- and strain rate-fracture behavior of Armox 500T steel target. Here, the GISSMO for Armox 500T is validated and the Johnson-Cook model for tungsten heavy alloy is calibrated against ballistic impact experiments involving depth of penetration measurements on stacked Armox 500T plates. Once validated, the model is used to explore designs of new steel-based armor system configurations for various impact conditions (i.e., impact angle of obliquity, standoff distance, and target span). This work is in collaboration with Defence Research and Development Canada, General Dynamics Land Systems - Canada (GDLS-C), and NP Aerospace.

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