

Investigation of the Effects of Variations of Object Features on a Generic Ballistic Missile

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Uncertainties in certain features of object geometries result in a loss of confidence in the signature assessment of the object. Knowledge of how specific object features impact a object's radar cross section (RCS) can assist identifying whether uncertainty in a particular object feature warrants a loss of confidence in the RCS.

This study in this paper shows the development of a general rule-of-thumb on how the RCS of a object varies as a function of specific object features. The objects of interest in this study are fictitious ballistic missiles. Four object features were investigated: fin size, nose cone shape, panel riveting along the sides of the missile, and heat shielding on the nose cone. By varying each of the four object features in a missile configuration and comparing to another configuration, a relationship between specific object features and their effect on the RCS of a ballistic missile can be obtained.

Methodologically, this study is comprised of two parts. The first part consists of a study where different missile configurations are modeled as facet files, evaluated in a high frequency asymptotic computational electromagnetic code (XPatch) and compared to obtain a parametric relationship between object features and radar signature.

The second part consists of a theory oriented approach to obtain a mathematical relationship between object features and radar signature. Based on the range of possible configurations that object's feature can take, one can estimate a range of possible values of the radar signature. This will enable the user of the signature data to have a better understanding of the object being assessed and object characteristics when a complete knowledge of object configuration is unavailable.

