THERMOPLASTIC COMPOSITES FOR ARMY APPLICATIONS
Design and Manufacturing of Composite Tailcone for XM-1002 Training Round Kinetic Energy Penetrators

Introduction
Kinetic energy penetrators (K.E.P) are the tanks main gun ammunitions. From the point of firing until they reach the target, they see a combined loading scenario that includes high temperatures, high pressures and extreme accelerations. Therefore the structural requirements for every one of its parts are very demanding.

Objectives
In training rounds, The kinetic energy penetrators are stabilized by an aluminum tail cone that provides aero dynamical stability and minimizes drag. These aluminum tailcone are machined from round stock and therefore are expensive and labor intensive. During the first part of this program it was proposed to produce the training rounds of low cost thermoplastic composites.

Materials Technology
Long Fiber Thermoplastic composites (LFT) combine the best of continuous reinforcements and short fibers by achieving excellent mechanical properties and allowing for conventional low cost polymer processing technologies such as extrusion.

Design
The loading scenarios were modeled using F.E.A. Several materials were considered for this applications but only Nylon 6/6 reinforced with 50% E-glass passed all the requirements. A steel insert was used to reproduce the threads of the part and to keep the mass of the tailcone constant.

Manufacturing
The process chosen for the fabrication of the composite tailcone was extrusion-compression molding. With this process, net shape parts can be produced at cycle times of 1 part per minute, without requiring any additional finishing operations.

Outcome and Findings
The use of thermoplastic composites allows for the saving of about 2 million dollars a year in the manufacturing of training round tail cones. The designed components are 50% cheaper than their aluminum equivalent and have the same performance under hydrostatic pressure and high temperature conditions.