Web Summary

AR-15 REFLEX SOUND SUPPRESSOR MODELING AND TESTING

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The objective of this project is to model a military-style sound suppressor using computational fluid dynamics (CFD) and ANSYS simulations to optimize the design. Suppressor development, since its invention, has generally been through trial and error along with a common understanding of fluid flow. The goal is to use the computer model, once correctly calibrated, to optimize the baffle arraignment and which reduces resources such as materials and labor normally associated with design.

The projectile being tested is a standard 5.56mm cartridge currently used by United States military and fellow NATO military forces. The CFD computer model will be simulated using a FLUENT 2-D, axisymmetric geometry and mesh. ANSYS structural models will model loads on suppressor parts caused by high-pressure combustion gases. A physical suppressor, manufactured with 7075 and 6061 aluminum, will be attached to an AR-15 rifle for testing.

In past, much of suppressor design has been through a trial and error process. For this project, the team utilized Solid Works, FLUENT computational fluid dynamics (CFD), and ANSYS Structural to provide critical information on the flows and forces associated with high-velocity combustion gases. This process led the team to design numerous suppressor designs which were tested physically as well as computationally.

The team has concluded after testing and simulating various barrel mountings and baffle arrangements, that certain suppressor characteristics have an impact on its sound reduction capabilities. A two-point mounting suppressor shows considerably better characteristics for depressurizing and cooling a projectile's expansion gases. In addition, sound reduction is positively affected with an increase of common baffles and expansion volume. Future suppressor design will benefit from knowledge of the testing.