

NOSTROMO

dynamics



PRESSURE RELIEF SYSTEM FOR HIGH PRESSURE MEDIUM CALIBER AMMUNITION

DR. ROY KELLY, NICOLAS BRUNO & MARCELO MARTINEZ

PREPARED FOR:

INSENSITIVE MUNITIONS & ENERGETIC MATERIALS TECHNOLOGY SYMPOSIUM
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BACKGROUND

- **DOD'S INSENSITIVE MUNITIONS EFFORT HAS LED TO SIGNIFICANT ADVANCES IN SAFETY OF AMMUNITION STOCKPILE.**
- **FEW IM IMPROVEMENTS MADE IN MEDIUM CALIBER AMMUNITION.**
 - **COMMON GUN FUNCTIONALITY**
 - **NATO STANDARDIZATION REQUIREMENTS**
 - **COMPLEX GUN & AMMUNITION INTERACTIONS**
- **US/INTERNATIONAL PATENT'S PENDING.**

PRESSURE RELIEF SYSTEM FOR MEDIUM CALIBER AMMUNITION

COMPRISES IM VENT PLUG OR BASE PLUG SURROUNDING PRIMER IN BASE OF CARTRIDGE CASE



FUNCTION

NORMAL OPERATION CONDITION

THE RUPTURE DISC AND
FUSIBLE MATERIAL WORK
TOGETHER TO SUPPORT
THE HIGH PRESSURE AND
HANDLING
REQUIREMENTS.

HIGH TEMPERATURE CONDITION

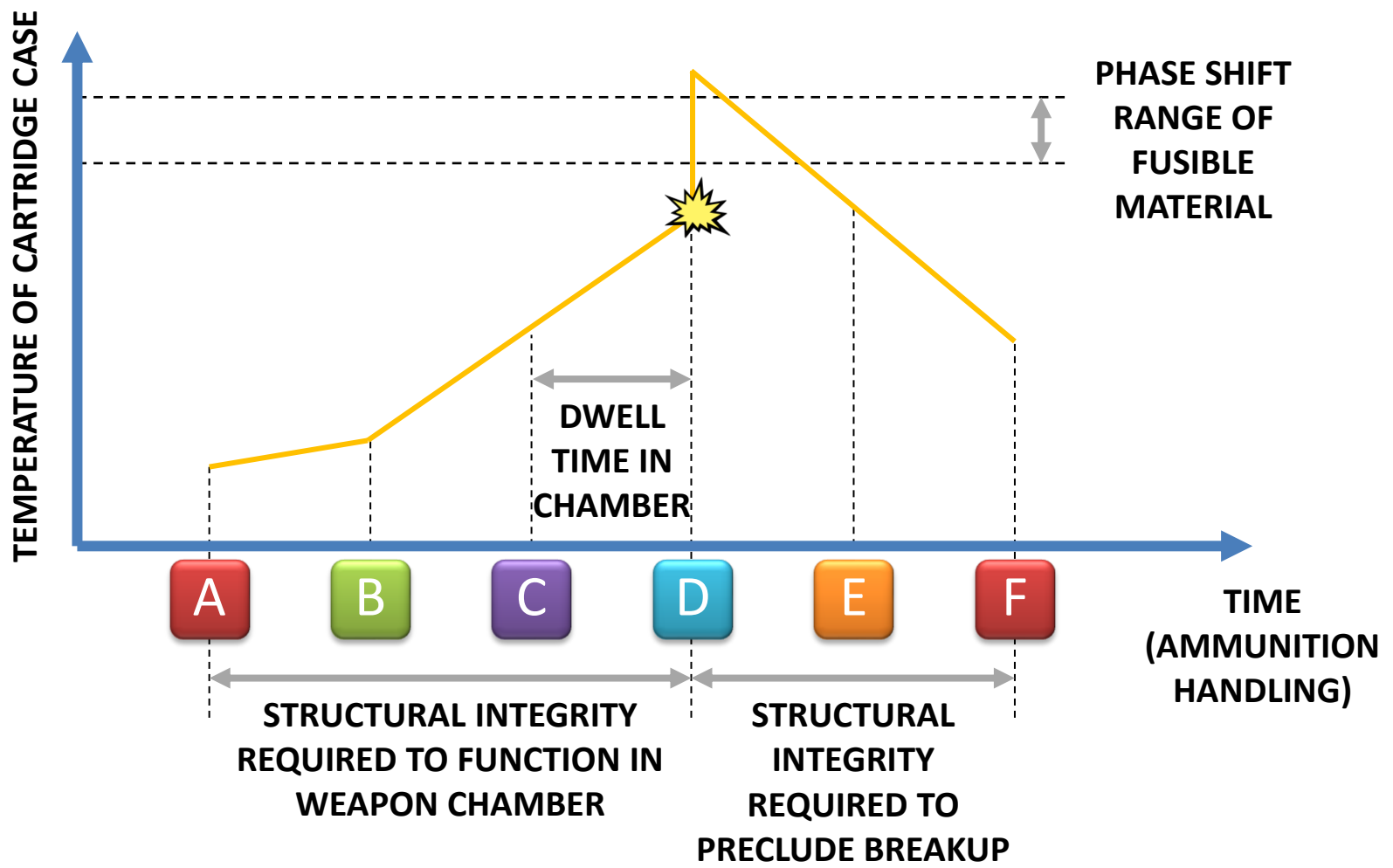
THE FUSIBLE MATERIAL
MELTS AND THE
RUPTURE DISC BREAKS
MINIMIZING THE
SEVERITY OF THE IM
RESPONSE.

AMMUNITION HANDLING



NORMAL OPERATION CONDITION

FUNCTION FIRE IN MOST AUTOMATIC WEAPONS AND CANNONS SIGNIFICANTLY RAISES THE CARTRIDGE CASE TEMPERATURE

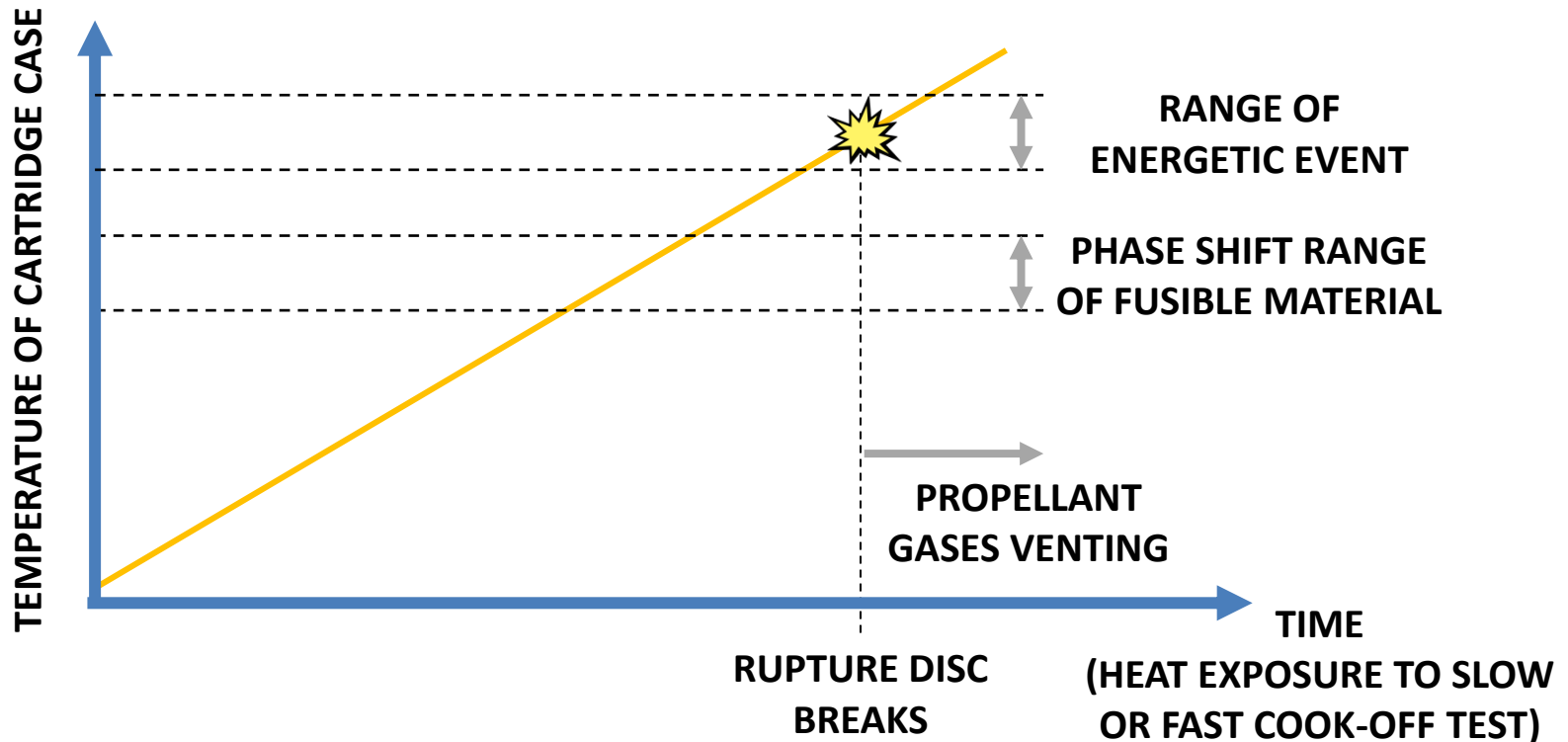


HIGH TEMPERATURE CONDITION

(SLOW AND FAST COOK-OFF TESTING TO MIL-STD-2105D)

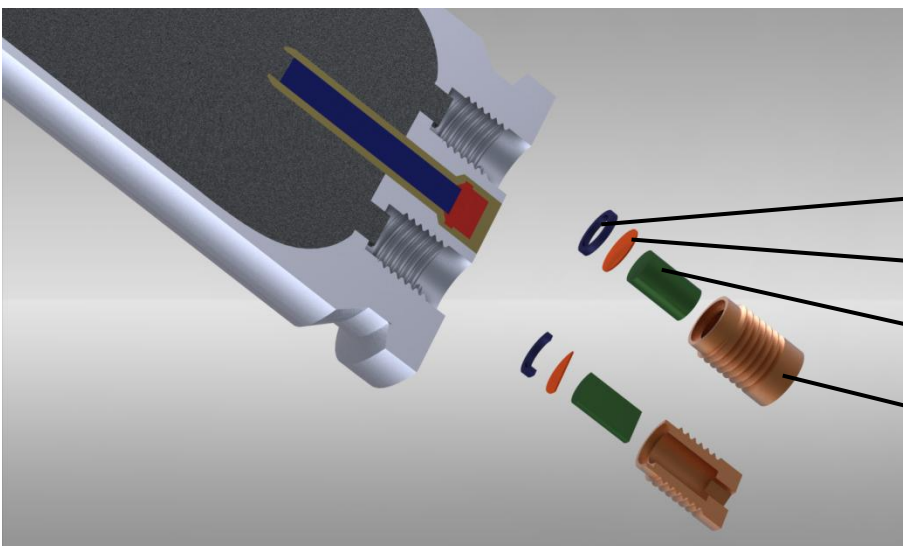
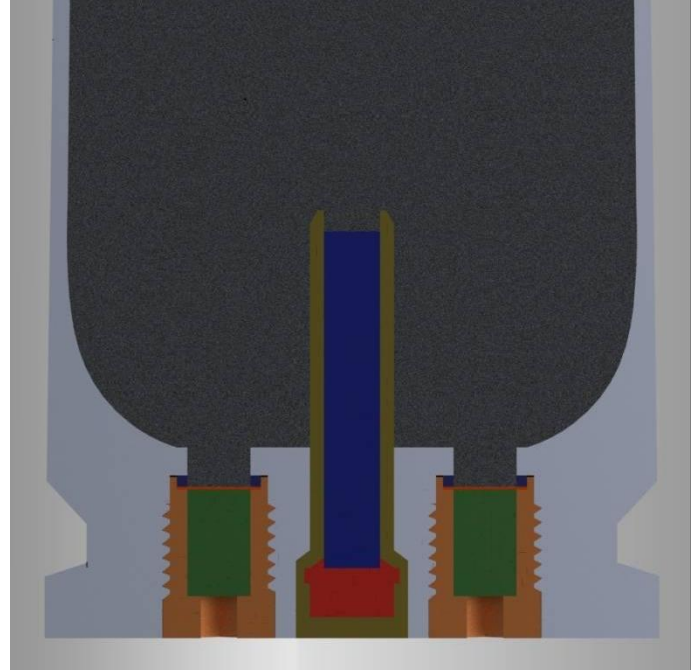
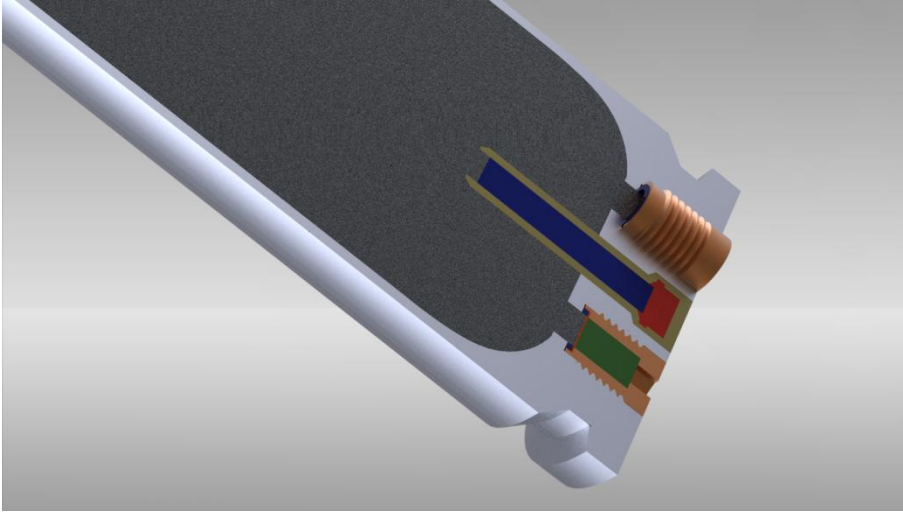
ENERGETIC EVENT:

- PRIMER INITIATES DUE TO HIGH TEMPERATURE. PROPELLANT BURNS DUE TO ENERGY RELEASED BY PRIMER.
- PROPELLANT INITIATES DUE TO HIGH TEMPERATURE.



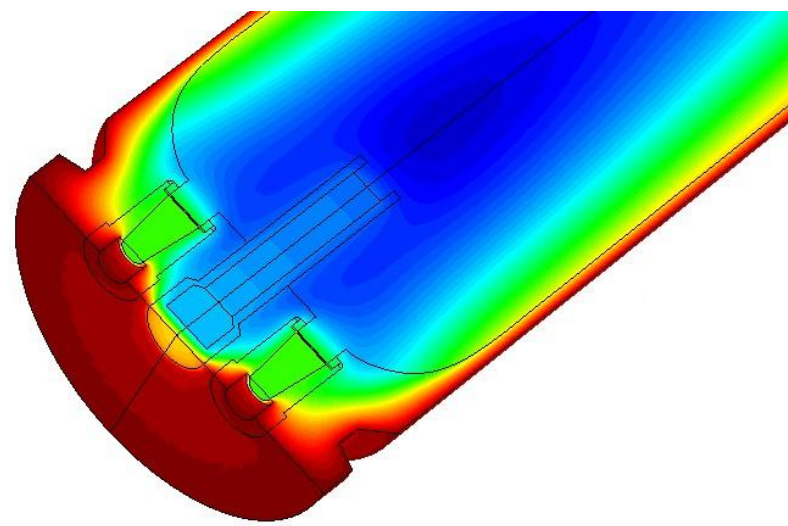


EXAMPLE DESCRIPTION

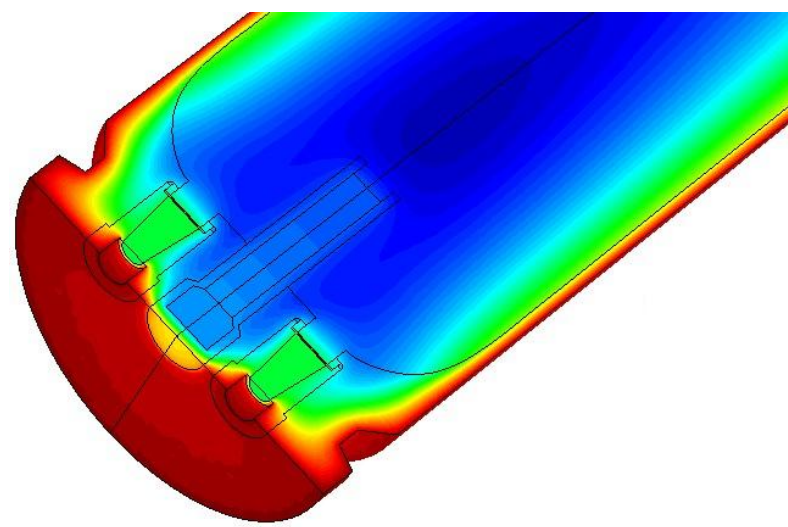
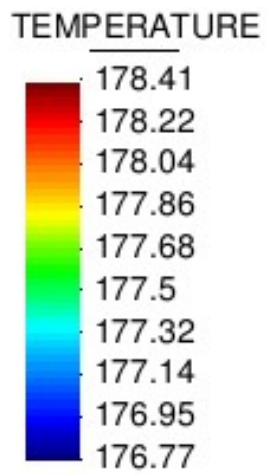


- SEAL RING
- RUPTURE DISC
- FUSIBLE MATERIAL
- RUPTURE DISC HOLDER

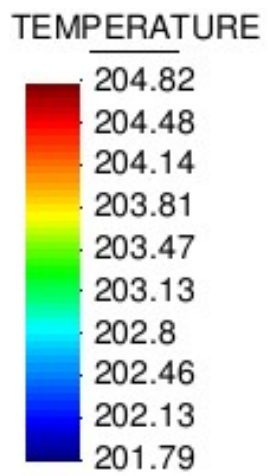
THERMAL ANALYSIS (SLOW COOK-OFF TEST)



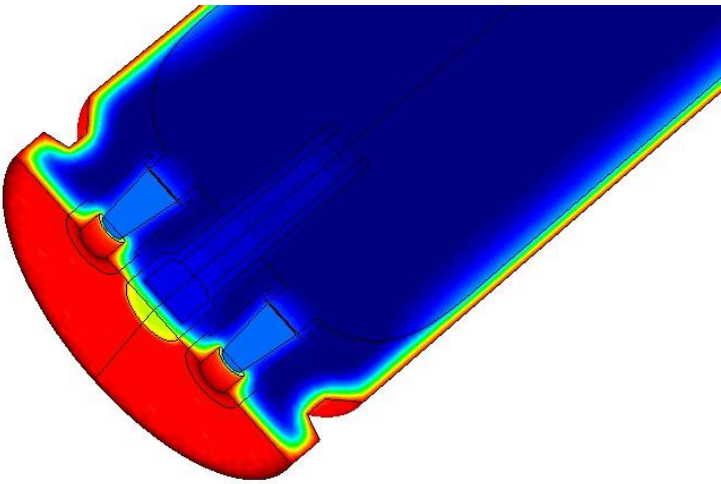
Time: 47 hours



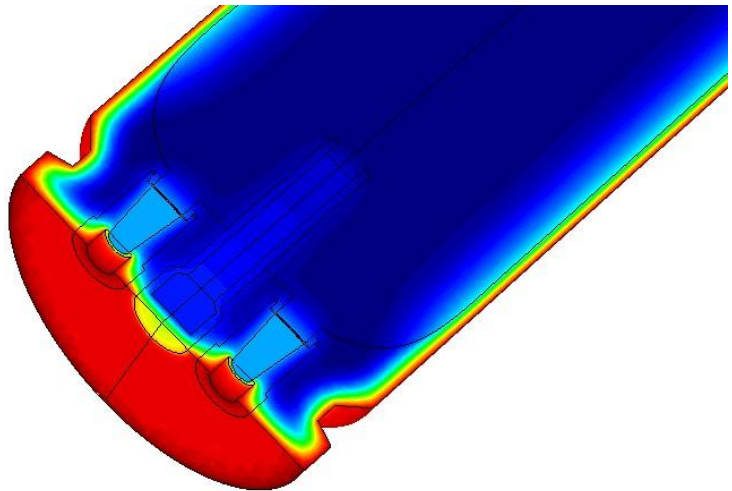
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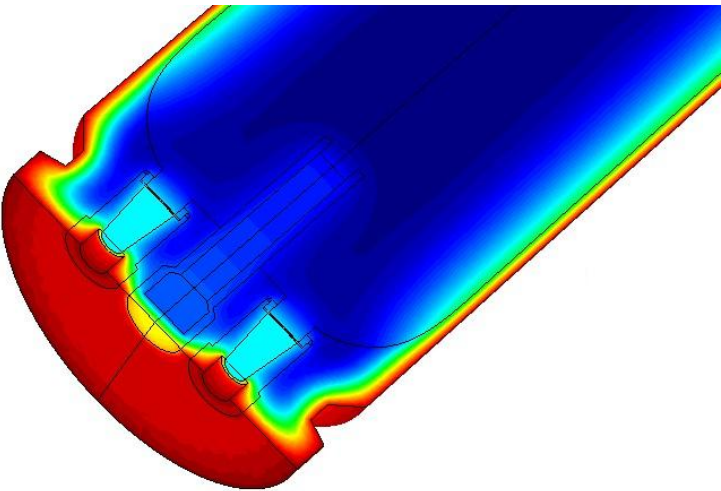
THERMAL ANALYSIS (FAST COOK-OFF TEST)



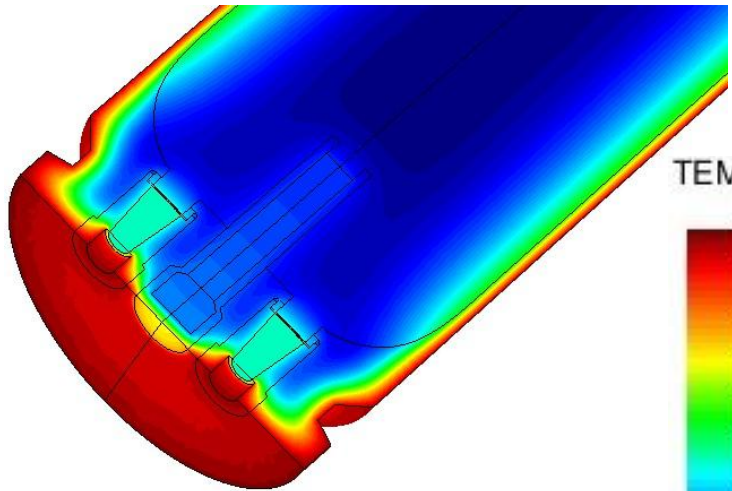
Time: 90 seconds



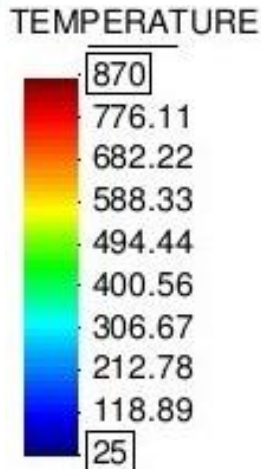
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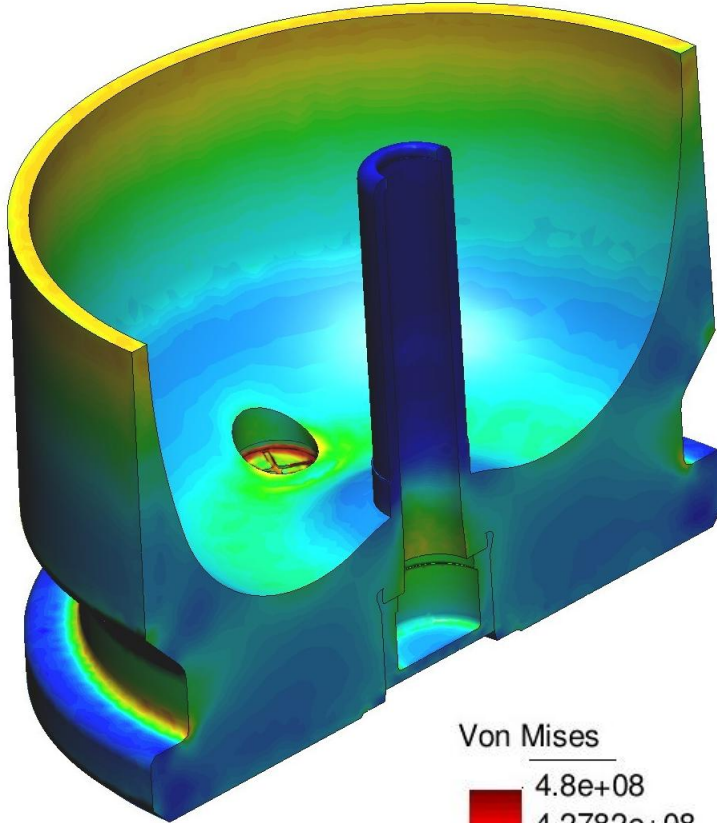
Time: 270 seconds



Time: 360 seconds

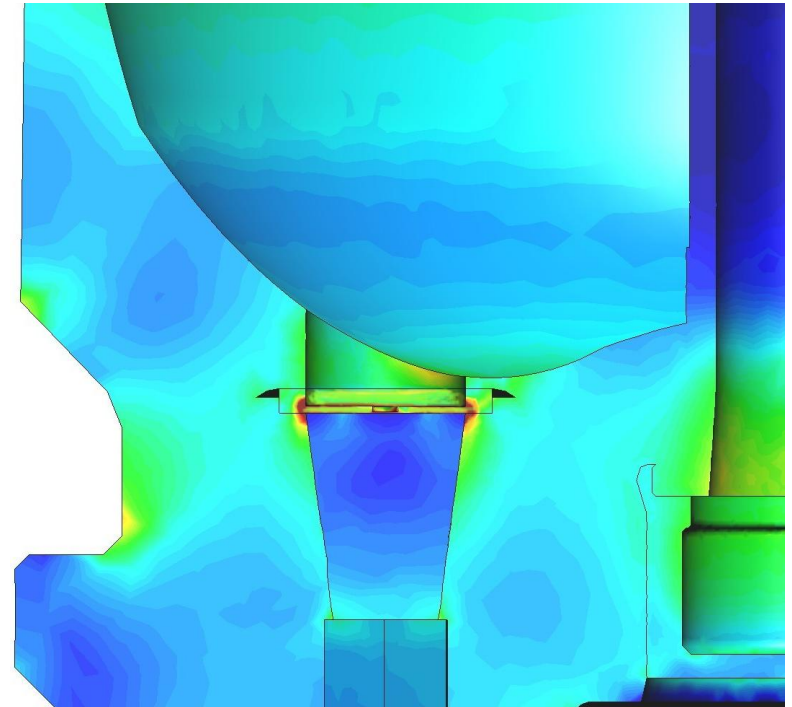
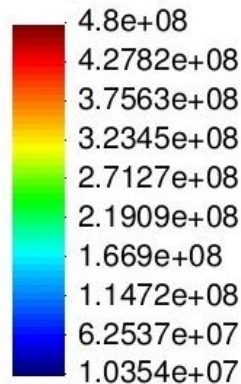


STRUCTURAL ANALYSIS (NORMAL OPERATION CONDITION)

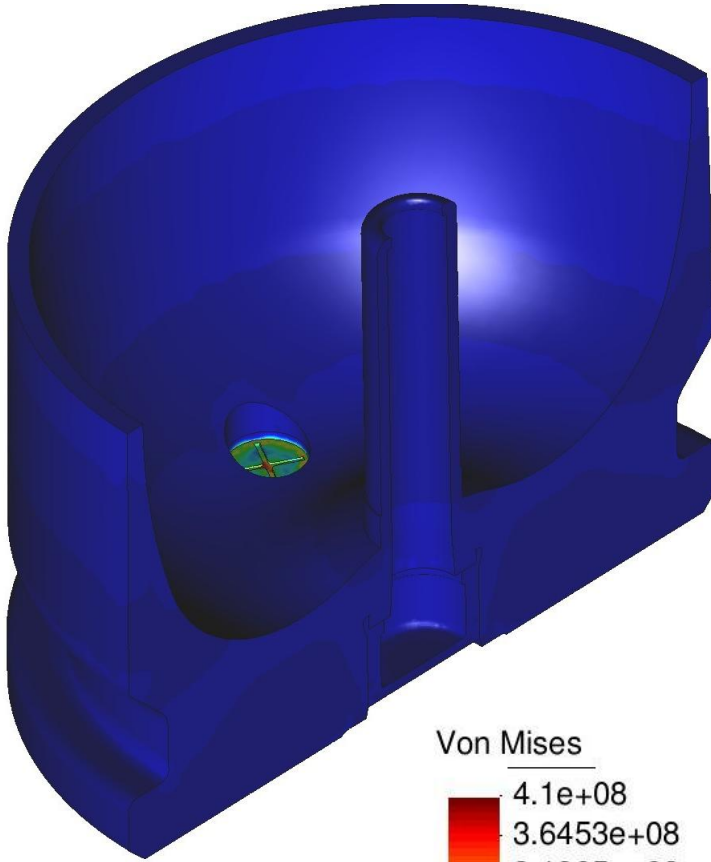


COMBUSTION CHAMBER PRESSURE: 450 MPA

Von Mises

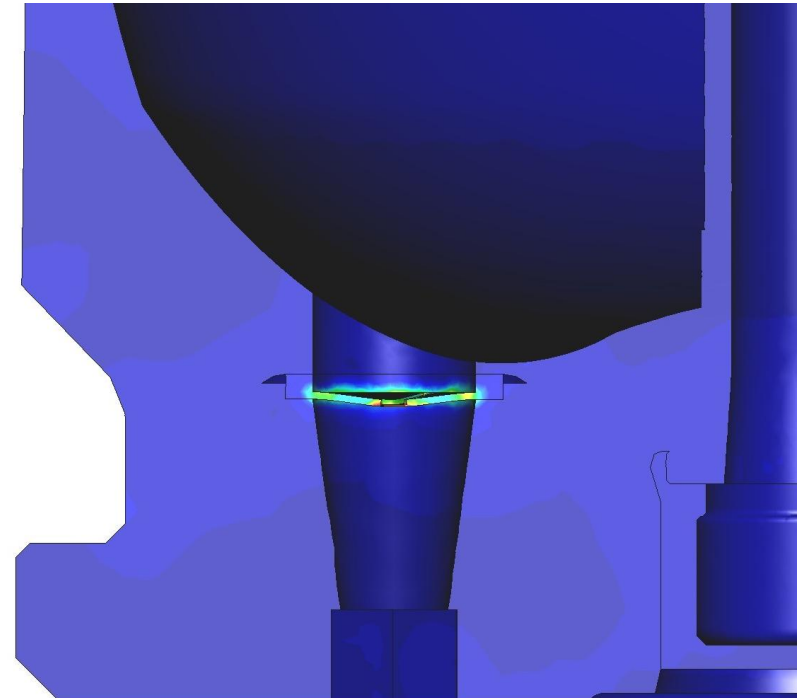
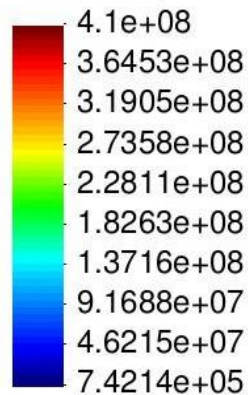


STRUCTURAL ANALYSIS (HIGH TEMPERATURE CONDITION)



COMBUSTION CHAMBER PRESSURE: 10 MPA

Von Mises



SUMMARY

- **A NEW IM MITIGATION CONCEPT HAS BEEN DEVELOPED COMPRISING A RUPTURE DISC AND PRESSURE RELIEF CHANNEL FILLED WITH FUSIBLE MATERIAL**
- **THERMAL AND STRUCTURAL ANALYSIS HAVE PROVEN OUT THE DESIGN IN NORMAL WEAPON OPERATION AND AT HIGH TEMPERATURES ASSOCIATED WITH SLOW AND FAST COOK-OFF**