

MSC.Software VPD Conference | July 17-19, 2006 | Huntington Beach, California

# The Creation of a Fully Functional Virtual Prototype of an Automatic Weapon Using MSC Adams

Paul Shipley AAI Corp

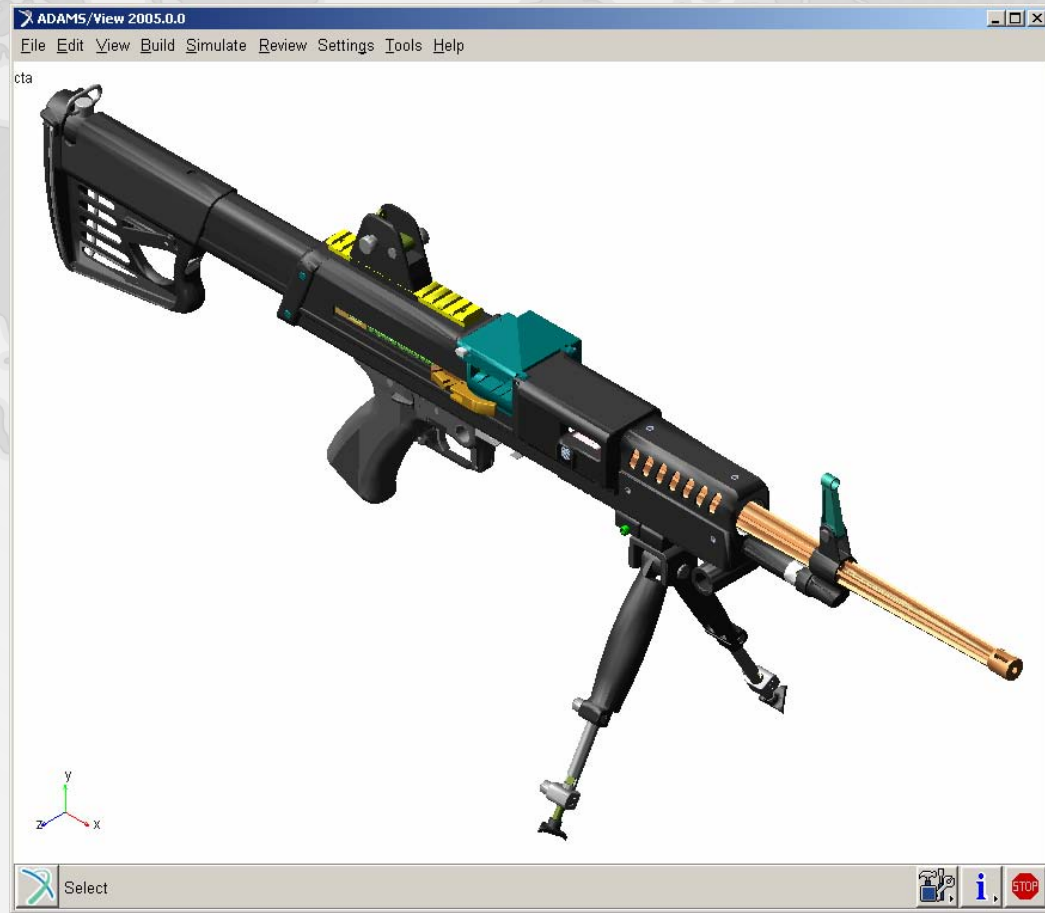
James McConville, MSC.Software Corp.





# Initial Model Assembly

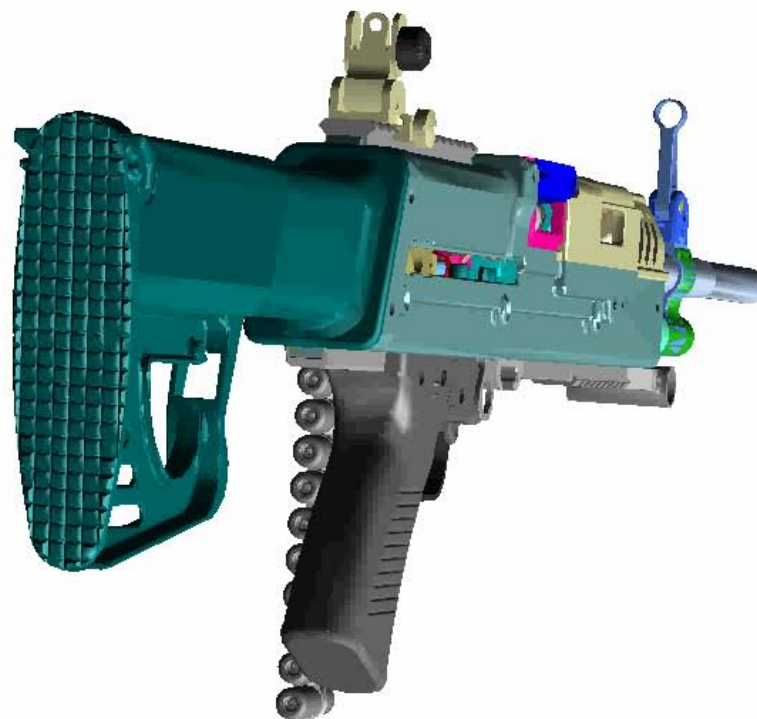
(Weapon fires plastic cased, telescoped ammunition from free belt or canister)





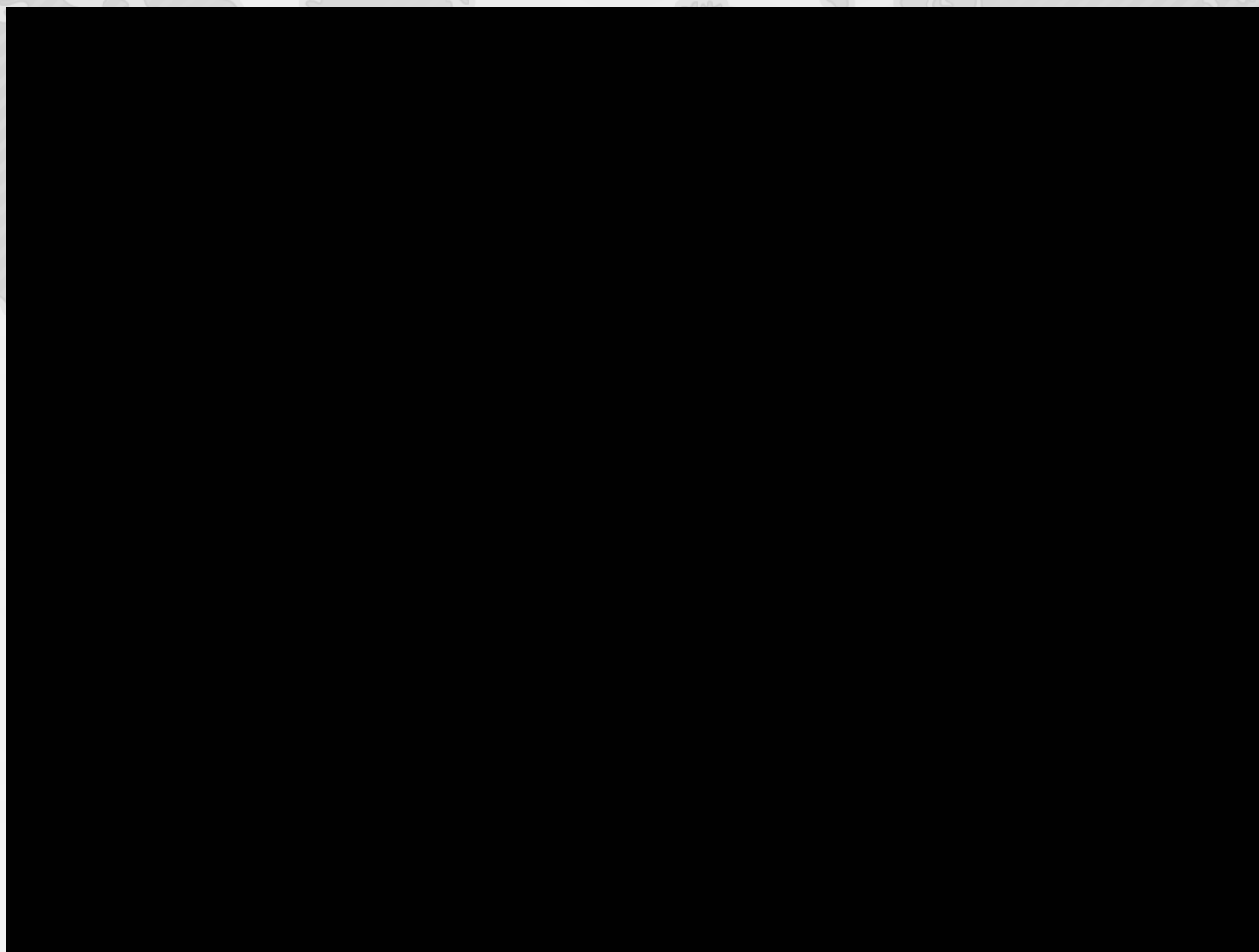
# Full Model Simulation (the VPD Prototype)

Last\_Run Time= 0.0000 Frame=0001





# Full Model Test (the iron prototype)



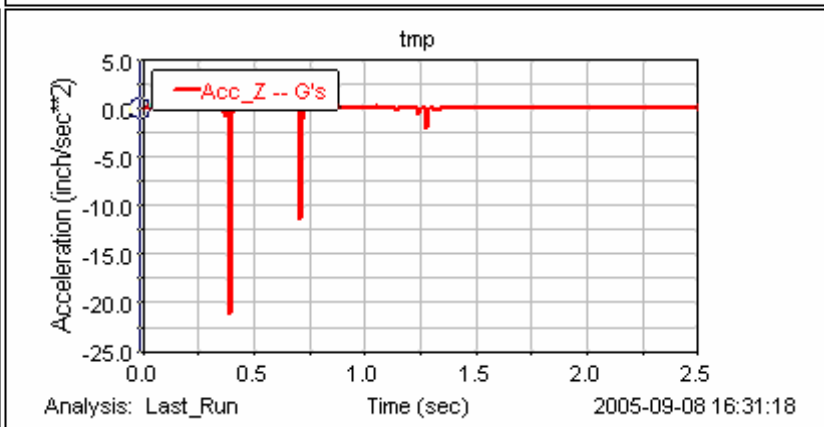
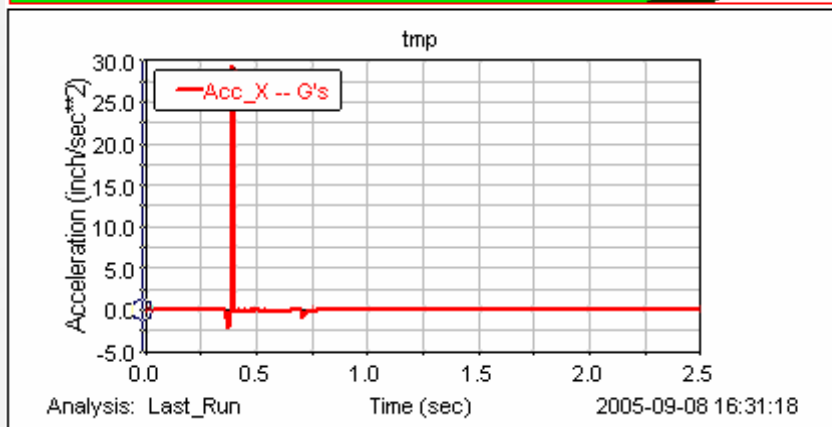
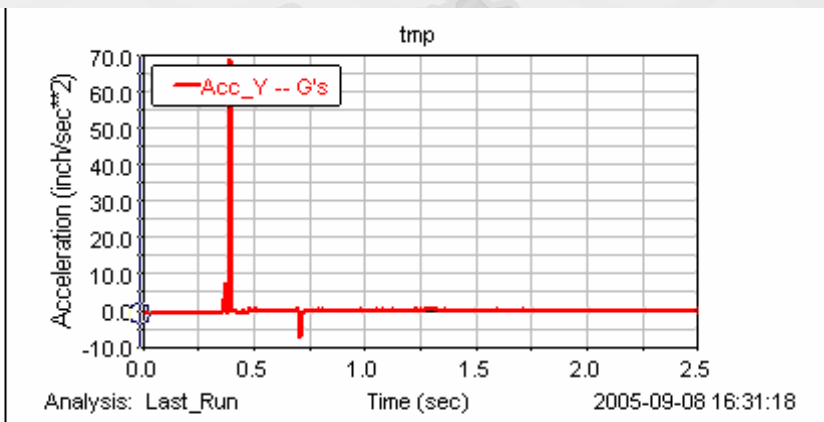


**Three simplified demos generated with the object of showing capability to the model weapon system holistically**

- 1) Durability Drop**
- 2) Mobility G's**
- 3) Infantryman Lift (Flex Weapon)**



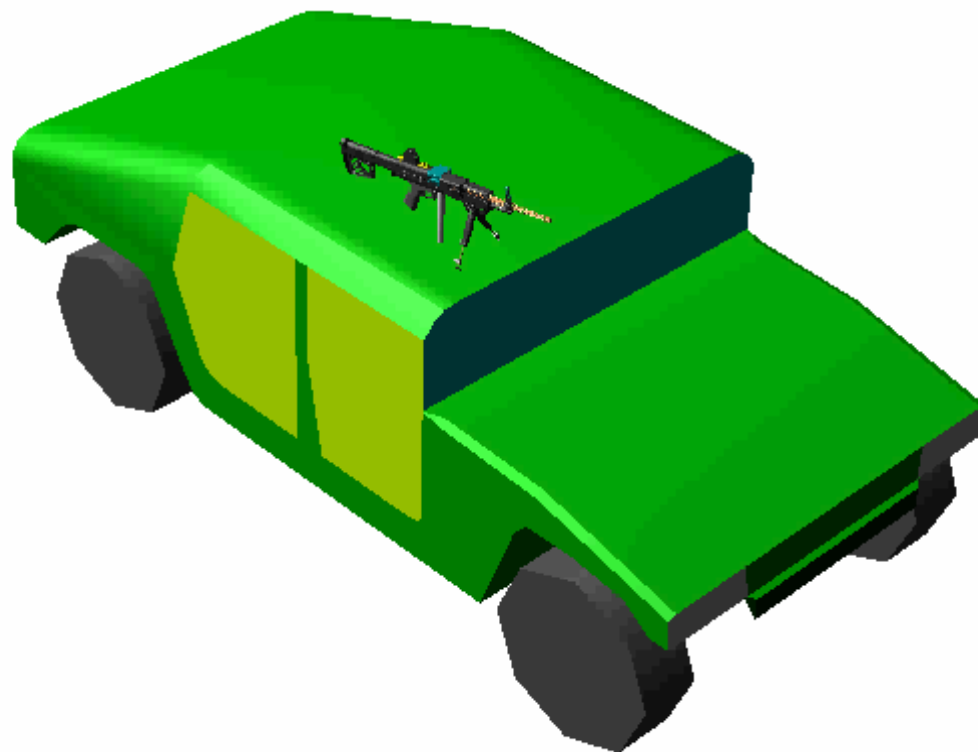
# Diversion 1 – Durability Drop



# Diversion 2 – Transport Knockaround



Last\_Run Time= 0.0000 Frame=001

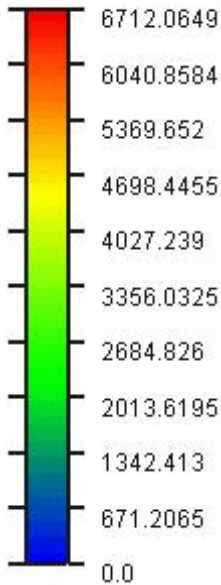


# Diversion 3 – Marine (a.k.a. ‘Grunt’) Lift (simplified, *flexible* weapon)



Last\_Run Time= 0.0000 Equilibrium Frame=001

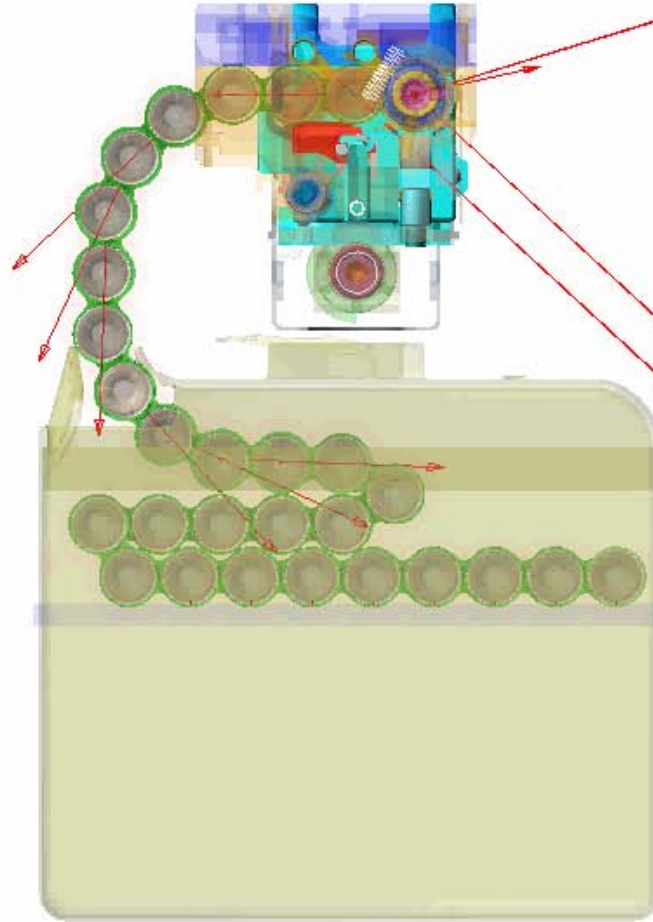
Von Mises Stress (psi) Max at Node 99 Time 0.91





# 30 Round Canister Feed

Last\_Run Time= 0.0000 Frame=0001





## **Non-Linear Elasto-Plastic Link Analysis Using MSC Nastran Solution 700 (LS\_DYNA)**

**Boundary Conditions (Adjacent Round Velocity Histories) Taken from Adams Critical Case Model**

**Rounds Modeled as Structurally Non-Deformable but Compliant in Contact**

**Link Material Elasto-Plastic with Specified Rupture Strain**

**Strain Rate Effects Ignored**





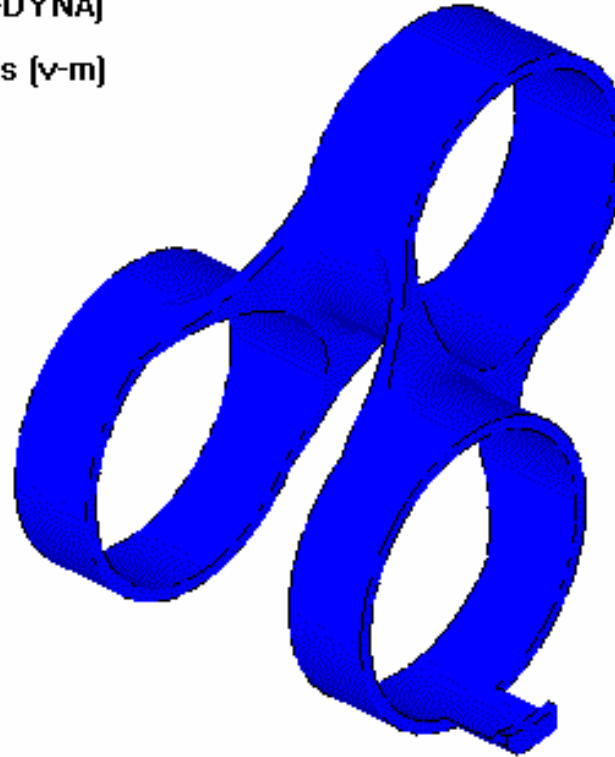
# Initial – Excessive (Incorrect) Boundary Conditions Imposed



# Correct Boundary Conditions



MSC.Nastran SOL 700 (LS-DYNA)  
Time = 0  
Contours of Effective Stress (v-m)  
min=0, at elem# 58148  
max=0, at elem# 58148



Fringe Levels

