GENERAL DYNAMICS
Armament and Technical Products

XM307 ACSW Dual Feeder and Receiver Design for Rough Handling

Presented by:

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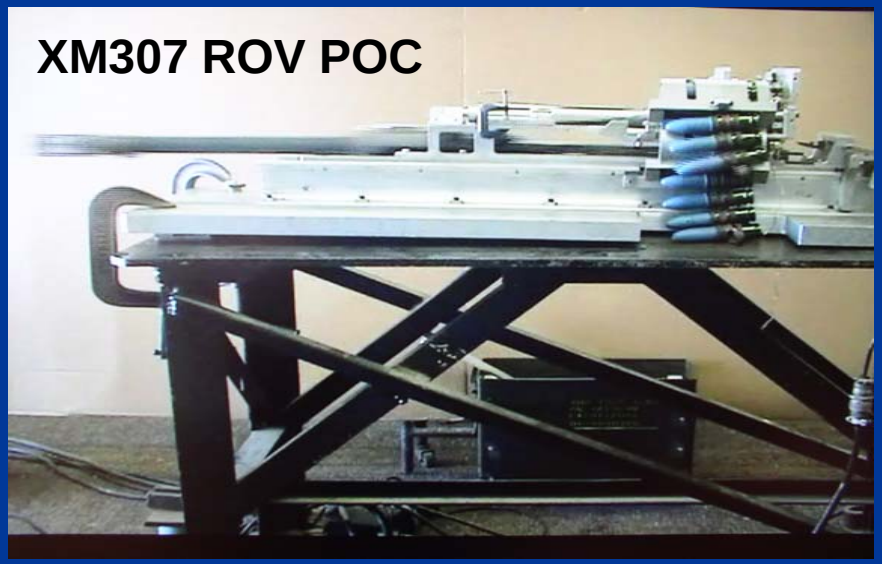
Agenda

- XM307 ACSW Dual Feeder
- Receiver Design for Rough Handling

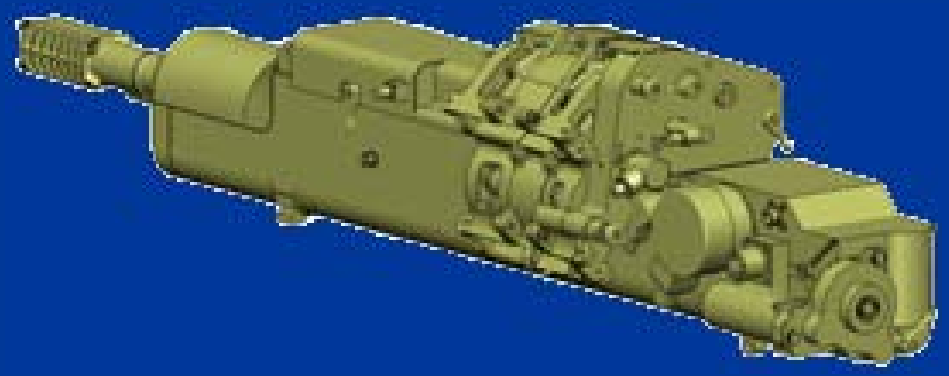
XM307 ACSW Dual Feeder

- Overview
- Key Requirements
- Design Approach
- Ammunition Select Sequence
- Analytical Model and Test Correlation
- Summary



XM307 Remotely Operated Variant (ROV)

- Light weight remotely operated dual feed weapon
- Provides armament for modern, light weight manned and unmanned vehicles
- First round selectable under 2 seconds
- Enable engagement with Armor Piercing (AP) or High Explosive Air Bursting (HEAB) 25 mm Ammunition



XM307 ROV

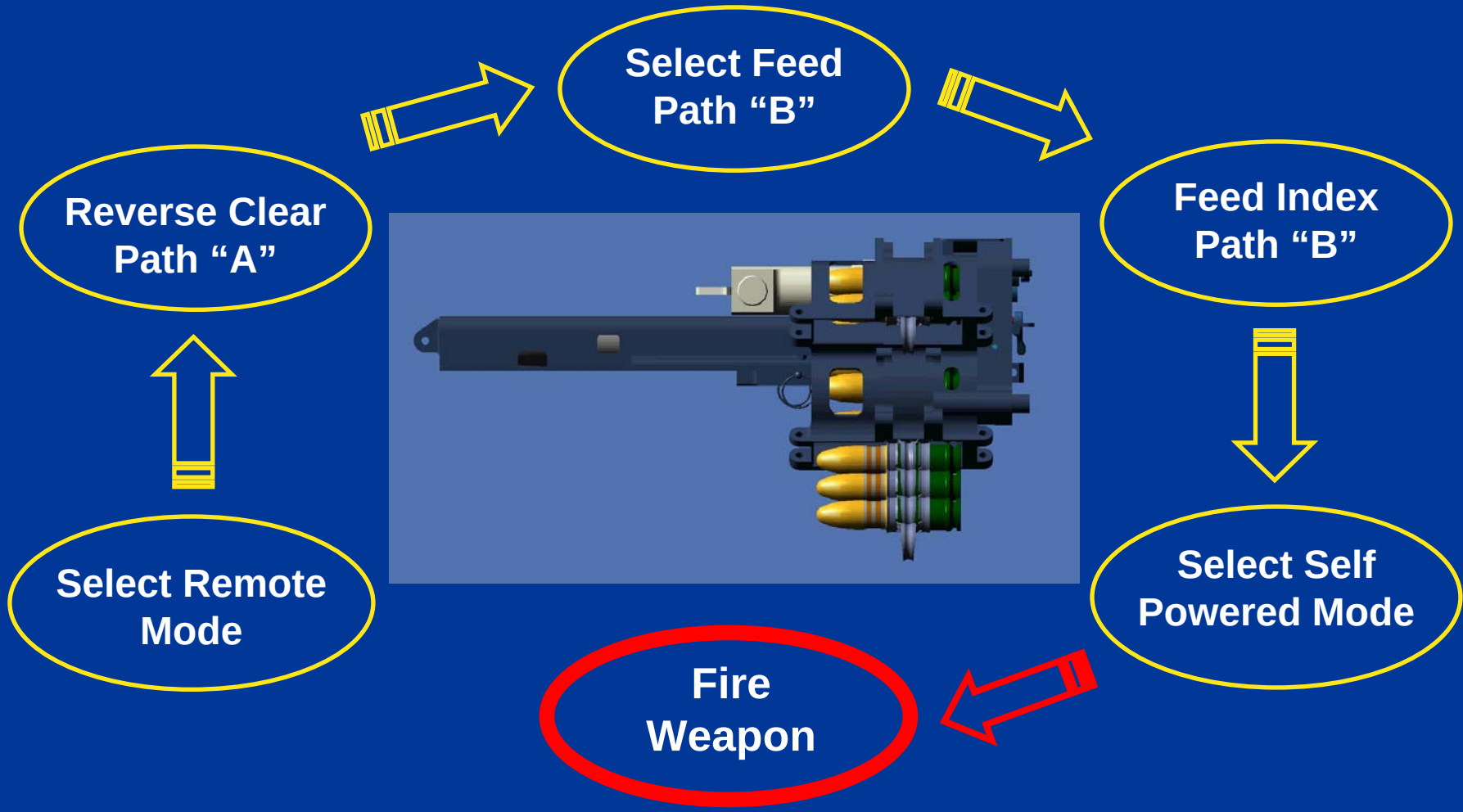
Key Requirements

- HEAB capability with either feed path
- Remotely change feed paths with first round response
- Weapon self powered operation

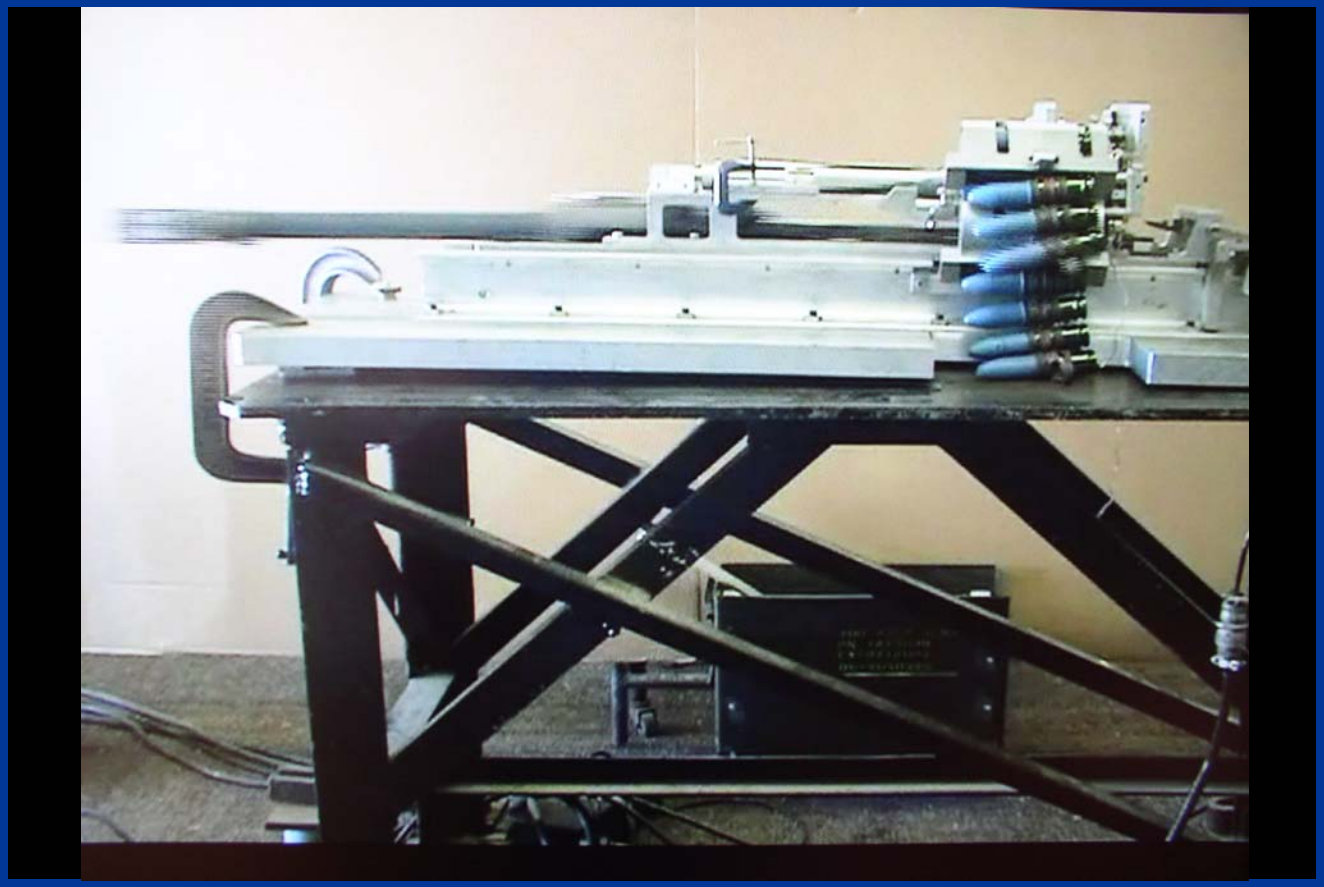
Design Approach

- Develop integrated dual feed weapon
- Validate design with concept hardware
- Create analytical models
- Evaluate design and correlate analysis predictions to concept test results

Ammunition Select Sequence



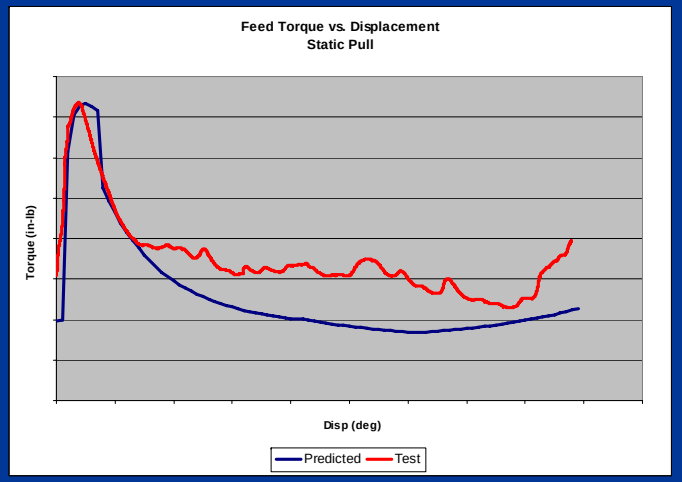
Live Fire Concept System Test

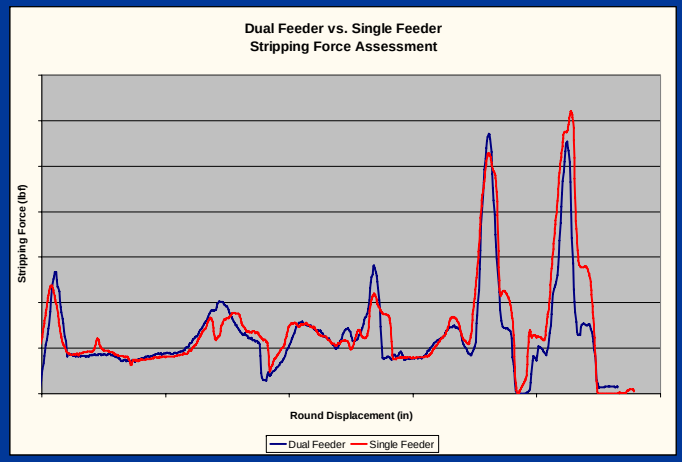


- Successfully test fired TP ammo from both feed paths

Analytical Model and Concept Test Correlation

- Functionality validated on Proof of Concept feeder assembly
  - Static and dynamic feed and clear
  - Round stripping and chambering
  - Belt select mechanism
  - Power select mechanism
- Concept test results correlated to analysis model predictions
- Verified analytical tools and test hardware reduced risk for objective dual feeder design





Summary

- Successfully completed preliminary design phase
- Dual feeder concept hardware functioned per design intent
- Analytical models correlated to concept test results
- GDATP's proven design methodology provides a solid foundation for future weapon development

Receiver Design for Rough Handling

- Requirements
- Objectives
- Analysis and Test Method
- Analytical Model and Test Correlation
- Summary

XM307 K50

Requirements

- Shall operate after 5 foot drop in 5 orientations
- No degradation to safe operation

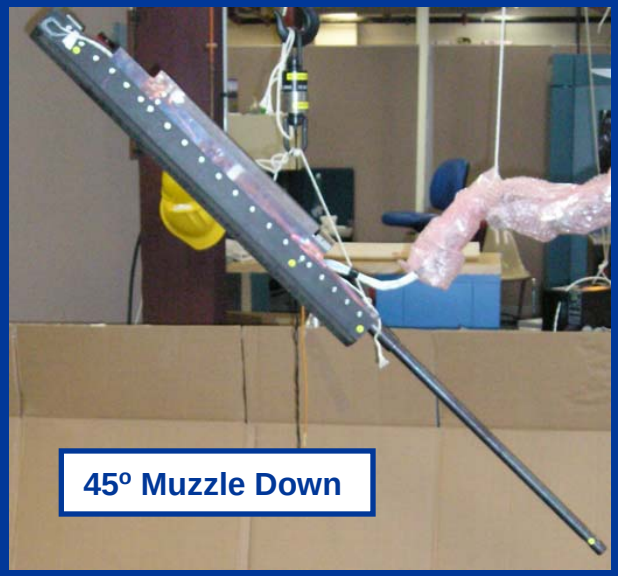
Objectives

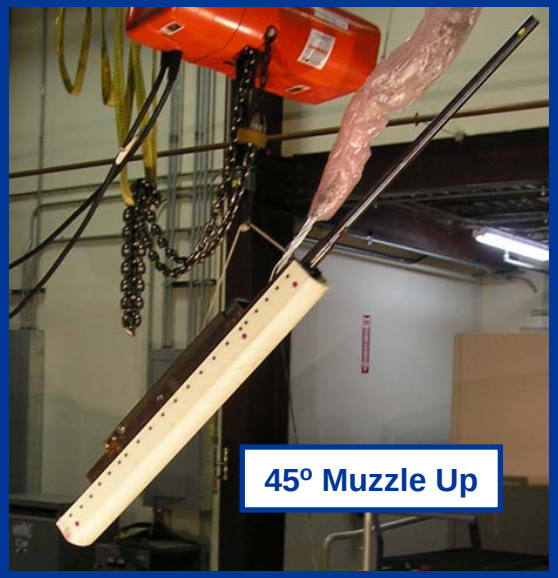
- Develop analytical methodology
  - Allows weapon reactions to be predicted and evaluated
  - Can be used for detail design of the weapon
- Develop Receiver configuration
  - Maintains alignment and timing of the machine gun mechanism
  - Allows the weapon to survive repeated 5 foot drops
- Validate the design approach and analytical methodology

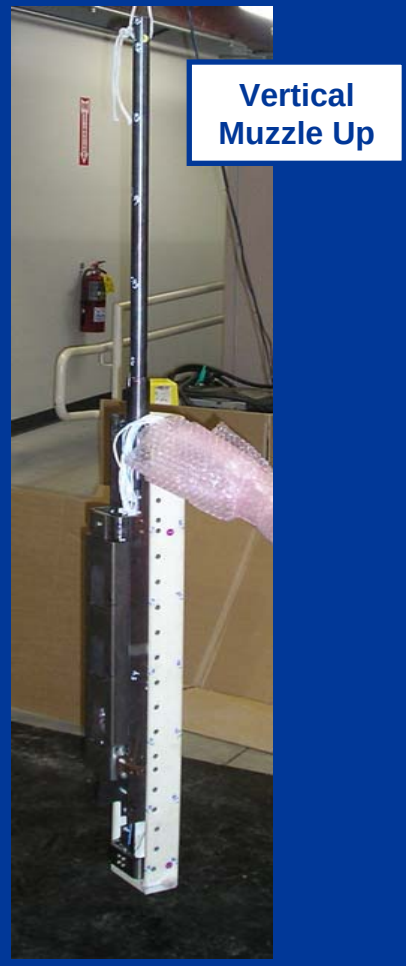
Analysis and Test Method

- Analysis methodology
  - Flexible body system level model created using FEA and flexible body analysis software
  - Simulated a 5 foot free-fall on a concrete-backed steel plate
  - Component CG accelerations used for detailed component design
- Drop a mockup weapon
- Evaluate alternate materials
- Data collection
  - Accelerations
  - Reaction loads between weapon components
  - Reaction strains in the receiver

Drop Orientations







Tests Conducted

- 69 drops were completed
  - 3 Materials
  - 4 orientations
  - 8 heights

Drop Height	Material 1 Drop Orientation			Material 2 Drop Orientation			Material 3 Drop Orientation			
	Horizontal	45° Nose Down	45° Aft Down	Horizontal	45° Nose Down	45° Aft Down	Horizontal	45° Nose Down	45° Aft Down	Vertical Aft Down
6	X	XX	X							
12	X	X	X	X	X	X	X	X	X	
24	X	X	XX	X	X	X	X	X	X	
30										X
36	XX	X	X	X	XX	X	X	X	X	
48	X	X	X	X	X	X	X	X	XX	
60	X	X	X	XX	XX	XX	XXXXXX	XXX	XXXX	X
78							X			

Drop Test Video

- Weapon mockup reaction to rough handling drop test
- 5ft height, 45º Aft Down Drop Orientation

Test Results
Material Summary


Material 1


Material 2


Material 3

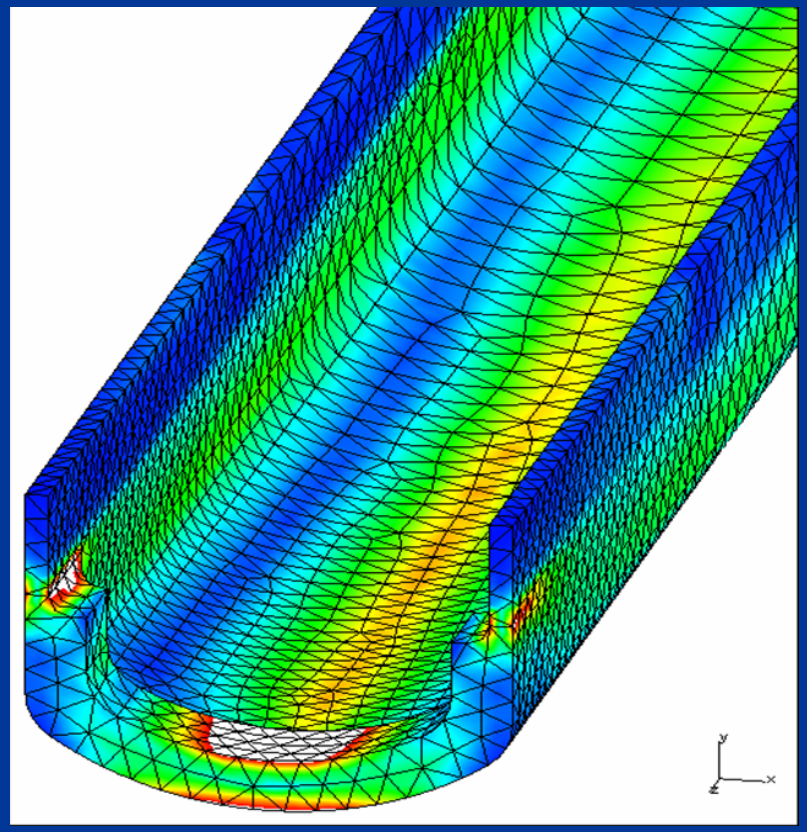
- Material 1 shell cracked after 9th drop
- Material 2 shell cracked after 19th drop
- Material 3 shell did not crack after 29 drops

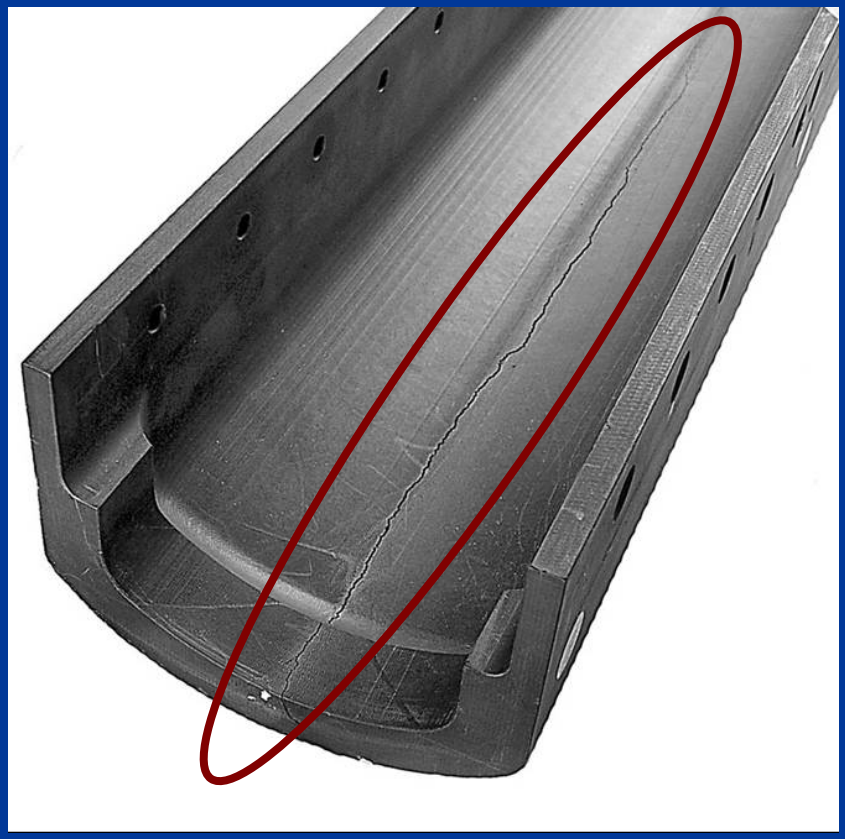
Analysis vs. Test Results
CG Accelerations

- Analytical CG accelerations correlated with test results

Drop Orientation	CG Acceleration, G's	
	Test	Analysis
Horizontal	497	489
45^{o} Muzzle Up	309	344
Vertical Muzzle Up	614	626

Analysis vs. Test Results
Strain





- Analysis method predicts failure at bottom center
- Receiver shell cracked at bottom center

Summary

- Receiver concept provides 5 foot drop capability
- Analytical methodology is a proven design tool
- GDATP's Methodology applied to develop lightweight objective weapons
  - Will meet severe rough handling requirements
  - Currently in fabrication

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