



Hudson Mohawk

Editor: Mark Frontera

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Newsletter

April 2006

Critical Fracture Processes In Army Cannons: A Review

**John H. Underwood,
Consultant, Battelle Scientific Services**

**US Army Armament Research
Development & Engineering Center
Benet Laboratories**

April 27th, 2006

6 PM Social Time and Buffet Dinner

7.45 PM Speaker

**Hudson Valley Community College
Room TBA**

To reserve your spot, contact Fred Willett
(willett1@asme.org or (978) 353-5306) by 5 PM
April 25th.

Abstract:

Fast fracture in cannons can be well described using elastic-plastic fracture toughness, in combination with comparisons of cannon section size relative to the size required to maintain plane strain fracture. *Fatigue fracture* of cannon tubes is modeled from results of full-size fatigue tests that simulate cannon firing. These tests are also the basis of fatigue-intensity-factor modeling of fatigue life, which incorporates material strength, initial crack size and Bauschinger-modified autofrettage residual stress into life predictions. *Environment-assisted fracture* in the thermally damaged near-bore region of fired cannons is shown to be controlled by hydrogen. High strength cannon steels are susceptible to hydrogen; cannon propellant gases provide the hydrogen; and the source of sustained tensile stress is the near-bore thermal damage and compressive yielding. A thermo-mechanical model predicts tensile residual stress of similar depth to that of

observed hydrogen cracks. *Coating fracture* in the thermal-damage region of fired cannons is characterized and modeled. The Evans/Hutchinson slip zone concept is extended to calculate in-situ coating fracture strength from observed crack spacing and hardness in the damaged region.

Biography:

John H. Underwood, senior research engineer, has been a member of the United States Army Research, Development and Engineering Center from 1965 to 2005. Mr. Underwood was named a US Army Fellow for the UK National Engineering Laboratory in 1975 and a fellow for the American Society for Testing and Materials in 1985. In 1987, he served as a visiting scientist to the Australian DOD Materials Research Laboratories.

He was awarded the George R. Irwin Medal from the American Society for Testing and Materials in 1990.

Mr. Underwood has published 8 books and 130 research papers in the United States, Europe and Australia.

Place:

Hudson Valley Community College – Room TBA
Troy, NY

Agenda:

Social time and buffet dinner 6 PM - 7:30 PM
Speaker 7:45 PM

Buffet Menu:

- Antipasto Salad
- Garlic Bread
- Sliced Melon with Berries and Grapes
- Pasta Alfredo
- Chicken Parmigiana
- Cannoli, Cookies, or Tiramisu
- Coffee or Soda

\$15 for members and their guests

\$20 for non-members

\$8 for students

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
HUDSON MOHAWK SECTION
PO BOX 206
Schenectady, NY 12301

Directions:

From the North: The Hudson Valley campus is minutes from exit 7 of the Northway (I-87). Follow Rte. 7 East approximately 1.5 miles to I-787 South. Take I-787 South to Rte. 378 East. Over bridge bear right to Rte. 4 south and continue for 1 mile to the campus on your left.

From the South: Take Exit 23 off I-87 (NYS Thruway). Follow I-787 North 6 miles to the exit for Rte. 378 East and follow as above.

From the East: Take Exit B-1 off the NYS Thruway and follow I-90 approximately 9 miles to Exit 8. Turn left off ramp to Route 4. Campus is 5 miles ahead on the right.

From the West: Take Exit 24 off I-90 (NYS Thruway), continue on I-90 East 6 miles to I-787 North (Troy). Follow I-787 as above.

To reserve your seat, contact Fred Willett at (978) 353-5306 or willettf1@asme.org by 5 PM April 25th.

Distribution of Section Newsletter

The Hudson Mohawk newsletter is posted at:
www.asme.org/sections/hudson-mohawk.

Once each newsletter is posted on the Section's web page, an e-mail notification and link to the above website is sent to members who have e-mail addresses in the ASME member database. If you are an active member of ASME and did not receive an e-mail notification, please go to the ASME web site and update your membership information.

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