Previous 2D AutoDyn mesh sensitivity analyses of cylinder impact on ceramic determined the 0.20-mm mesh size provides a fracture pattern that may be considered acceptable.

Previous mesh sensitivity analyses used a constant erosion strain value of 1.0 for the projectile and 2.0 for the target. Using the accepted 0.20-mm mesh size, analysis has been conducted to determine the effect of erosion strain on target fracture patterns and projectile kinetic energies.

Erosion strain sensitivity analysis is performed using three different geometric strain values for both the target and projectile, totaling 9 different models.

We will explore the effect of plastic strain erosion in further AutoDyn analyses.
MONTHLY REPORT
JUNE 2013

MODELING AND SIMULATION OF CERAMIC ARRAYS TO IMPROVE BALLISTIC PERFORMANCE
Previous 2D AutoDyn mesh sensitivity analyses of cylinder impact on ceramic determined the 0.20-mm mesh size provides a fracture pattern that may be considered acceptable.

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We will explore the effect of plastic strain erosion in further AutoDyn analyses.
Axi-Symmetric Model Geometry

Gap between target and projectile = 0.14-mm

X-axis is axis of rotation

\[ V_P = 500 \frac{mm}{ms} \]

Ceramic Target

RCC Projectile
### Erosion Parameters Examined

<table>
<thead>
<tr>
<th>NOMENCLATURE</th>
<th>GS</th>
<th>P-0.5</th>
<th>P-1.0</th>
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<tr>
<td>T-0.5</td>
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<th>GS- Geometric Strain Erosion</th>
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<th>PS – Plastic Strain Erosion</th>
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<tbody>
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<td>T-1.0</td>
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<tr>
<td>T-2.0</td>
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</tbody>
</table>

This case is represented by PS-P-1-T-1
Fracture Pattern T-0.5, $t = 0.040$-ms

Conclusion: P-2 fracture does not agree with other two cases
Fracture Pattern T-1, $t = 0.040$-ms

Conclusion: Target has similar fracture for all cases.

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Fracture Pattern T-2, $t = 0.040$-ms

Conclusion: Target has similar fracture for all cases

2013 © University of Delaware
Fracture Pattern $P-0.5$, $t = 0.040$-ms

Conclusion: $T-0.5$ fracture does not agree with other two cases
Fracture Pattern P-1, t = 0.040-ms

Conclusion: T-0.5 fracture does not agree with other two cases
Fracture Pattern P-2, \(t = 0.040\text{-ms}\)

Conclusion: T-0.5 fracture does not agree with other two cases
Energy Profile: P-0.5
Energy Profile: P-1
Energy Profile: T-0.5
Energy Profile: T-1
Energy Profile: T-2

![Energy Profile Graph]

- **Legend:**
  - P-0.5
  - P-1
  - P-2

**Axes:**
- **Y-axis:** Projectile KE, kJ.
- **X-axis:** Time, ms.

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Fracture Pattern GS vs. PS
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If you use our Wait List, we recommend that you confirm your current reservation information. In the event we're unable to reach you to confirm your changes, it is always prudent to check your confirmation on our website or to call our Reservation Office 48 hours ahead of your requested travel date to confirm your final reservation.

Please review the following information for accuracy.

You may view or change this information online at http://www.steamshipauthority.com, click on View/Change/Cancel Existing Reservations. You may also call our Reservation Office at (508) 477-8600 during normal business hours.

Reservation Number: 6992930 Name: RICHARD & DEB WOOL

Phone Numbers:
Home: 302-369-9488 Island:
Work: 302-831-3312 Cell:

Vehicle Information:
Year: 2003 Make: JAGU Model: XJ8 : 4-DR. SEDAN
State: DE Plate: RICH1 Type: CAR/TRL<15FT

Reservation Information
Trip Day Date Time From To Vehicle Adult Child
203 Sunday 07/28/2013 07:30A Woods Hole Vineyard Haven CAR/TRL<15FT 1 0
032 Sunday 08/11/2013 09:30P Vineyard Haven Woods Hole CAR/TRL<15FT 1 0

Pricing & Payment Information

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Issued Subject to terms and conditions of the applicable tariff regulations on file and subject to the acceptance by the purchaser of the following conditions:

1. Vehicles less than 20 feet must be canceled at least fourteen (14) days in advance of scheduled departure time to receive a refund. Vehicles over 20 feet must be canceled at least 24 hours before scheduled
DEPARTURE TO RECEIVE A REFUND.

2. THERE IS A $10.00 PROCESSING CHARGE FOR ALL REFUNDS REGARDLESS OF WHEN CANCELLATION NOTICE IS RECEIVED.

3. RESERVATIONS MAY BE CHANGED UP TO ONE HOUR BEFORE THE SCHEDULED DEPARTURE. ONE DATE CHANGE MAY BE MADE TO A VEHICLE RESERVATION AT NO CHARGE. HOWEVER, IF THE CHANGE IS MADE LESS THAN FOURTEEN (14) DAYS IN ADVANCE OF SCHEDULED DEPARTURE, THE CHANGED RESERVATION WILL NOT BE ELIGIBLE FOR A REFUND IF SUBSEQUENTLY CANCELED. YOU HAVE ONE DATE CHANGE AT NO CHARGE, ALL OTHER CHANGES MAY BE MADE ONLY UPON PAYMENT OF AN ADDITIONAL NON-REFUNDABLE $10.00 CHARGE.

4. RESERVATIONS ARE VALID FOR ONE YEAR FROM THE DATE THEY WERE ORIGINALLY ISSUED, SUBJECT TO ALL REFUND AND CANCELLATION POLICIES AFOREMENTIONED.
Profile: 797480 Reservation: 6992939 - Electronic Reservation Confirmation -- Transaction ID: 63126146

SSAInfoDoNotReply@steamshipauthority.com
Sent: Tuesday, April 09, 2013 2:00 AM
To: Wool, Richard P

Please do not respond to this email as this email address is not monitored.

To receive Steamship Authority e-mails in your inbox (not junk or SPAM folders), please add reservations@steamshipauthority.com and @steamshipauthority.com to your safe sender list.

If you use our Wait List, we recommend that you confirm your current reservation information. In the event we're unable to reach you to confirm your changes, it is always prudent to check your confirmation on our website or to call our Reservation Office 48 hours ahead of your requested travel date to confirm your final reservation.

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Reservation Number: 6992939 Name: RICHARD & DEB WOOL

Phone Numbers:
Home: 302-369-9488 Island:
Work: 302-831-3312 Cell:

Vehicle Information:
Year: 2012 Make: TOYO Model: CAMRY : 4-DR. SEDAN
State: DE Plate: DEB1 Type: CAR < 17FT

Reservation Information

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<th>To</th>
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<td>Vineyard Haven</td>
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<td>Woods Hole</td>
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Paid By: Visa Ending with 9306 Amount: 153.00

ISSUED SUBJECT TO TERMS AND CONDITIONS OF THE APPLICABLE TARIFF REGULATIONS ON FILE AND SUBJECT TO THE ACCEPTANCE BY THE PURCHASER OF THE FOLLOWING CONDITIONS:

1. VEHICLES LESS THAN 20 FEET MUST BE CANCELED AT LEAST FOURTEEN (14) DAYS IN ADVANCE OF SCHEDULED DEPARTURE TIME TO RECEIVE A REFUND. VEHICLES OVER 20 FEET MUST BE CANCELED AT LEAST 24 HOURS BEFORE SCHEDULED
DEPARTURE TO RECEIVE A REFUND.

2. THERE IS A $10.00 PROCESSING CHARGE FOR ALL REFUNDS REGARDLESS OF WHEN CANCELLATION NOTICE IS RECEIVED.

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