PRODUCED BY
GENERAL MOTORS CORPORATION

FUEL TANK PROPOSAL
RICHARD S. MARTIN
CHEVROLET & GMC C-K TRUCK
PICKUPS & CHASSIS-CABS
1983 PRODUCTION

PURSUANT TO PROTECTIVE ORDER
Pursuant to Protective Order

GM42S/DP52-016
QUESTION 4
00950

E13-A4
000350

SUMMARY:

A series of tests were run between September, 1981 and May, 1982 to determine collision performance of the fuel system. The tests included:

1. Added external tank shield
2. Performs satisfactorily at 50 mph
3. Does not prevent tank failure at 50 mph due to distortion
4. Internal tank liner is not potential to prevent failures at 50 mph

SUMMARY:

Alternate tank locations were considered for more effective external protection. To prevent puncture due to separation from tank MtG., the highest degree of protection will be attained.

Proposal for long lead time to prevent distortion of rear axle over the spare tire ahead of the rear axle inside of the frame.
Steel Shield (‘Fair Design’)

<table>
<thead>
<tr>
<th>Weight</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>25#</td>
<td>$15.00</td>
</tr>
<tr>
<td>14#</td>
<td>$8.00</td>
</tr>
<tr>
<td>39#</td>
<td>$23.00</td>
</tr>
</tbody>
</table>

Total Weight and Cost: 39# $23.00

Approximate Tooling Cost: $500,000.00

Disadvantages:
- High weight
- Clearance problems between body, cab and steel shield.
- Shield retention problems - bolted to frame rail.
- Fuel tank service problems - difficult to service tank without removing shield.

Advantages:
- Positive barrier - border plate protection.
<table>
<thead>
<tr>
<th></th>
<th>Blow Molding</th>
<th>The-casting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nominal</td>
<td>Nominal</td>
</tr>
<tr>
<td></td>
<td>100 mil</td>
<td>100 mil</td>
</tr>
<tr>
<td></td>
<td>Wall</td>
<td>Wall</td>
</tr>
<tr>
<td>Tank weight, lbs.</td>
<td>2.8</td>
<td>10.00</td>
</tr>
<tr>
<td>Cycle time, min.</td>
<td>2.3</td>
<td>1.30</td>
</tr>
<tr>
<td>Tanks/hours</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>/years**</td>
<td>306,000</td>
<td>408,000</td>
</tr>
<tr>
<td>Molds acquired/vehicle</td>
<td>1.14</td>
<td>0.10</td>
</tr>
<tr>
<td>Total cost (pieces)</td>
<td></td>
<td>175,000</td>
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<tr>
<td>Resin cost/tank</td>
<td></td>
<td>1.30</td>
</tr>
<tr>
<td>/100c (950c/lb.)</td>
<td>$4.55</td>
<td></td>
</tr>
<tr>
<td>Mold cost/tank</td>
<td>$0.08</td>
<td>$0.07</td>
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<tr>
<td>Total resin and mold costs/tank</td>
<td>$4.83</td>
<td>$5.17</td>
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<tr>
<td>Labor &amp; burden $25.00/hour/tank</td>
<td>$0.42</td>
<td>$0.29</td>
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<tr>
<td></td>
<td>$5.25</td>
<td>$5.45</td>
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</tbody>
</table>

- Each process assumed to have a two-cavity mold which produced two shields.
- Based on 6000 hours/year at 85% efficiency for both processes.
- Amortized over 3 years.
- One mold may be used — estimated cost: 350,000.
Plastic Bladder Fuel Tank

Cost of plastic bladder $20.00

New sending unit - 8 screw attachment (additional part and labor cost) 4.00

New design and attachment of fuel fill and vent lines 4.00

Disadvantages:
New fuel tanks
Barrier tests will be necessary.

Advantages:
No exterior clearance problems.
Looks like a clean cut design from the exterior.
Two Piece Plastic Shield

Advantages:
Light weight
Excellent impact strength
Thermostamping has better dimensional uniformity.
Can be retrofitted
Lower cost
Ease of assembly compared to liner.

Disadvantages:
Some creep
Must be retained securely to reduce effect of creep.