```
C:\\Forensic Scenes\\Tpr. Heath Sears\\09-0105A024-1    Job Description: \par
07:55:46 [redacted]                                                 Page No.: 1\par
----------------------------------------------------------------------------\par
1 X:     0.000 Y:     0.000 Z:     0.000 D:  RP\par
99 X:    21.049 Y:   -63.986 Z:    -4.348 D:  RM1 CITY LIMIT\par
100 X:   437.770 Y:  -141.750 Z:    16.092 D:  XWL1\par
101 X:   387.964 Y:  -128.875 Z:    14.965 D:  XWL1\par
102 X:   333.346 Y:  -114.896 Z:    14.062 D:  XWL1\par
103 X:   283.275 Y:  -102.150 Z:    12.741 D:  XWL1\par
104 X:   233.587 Y:   -89.555 Z:    10.811 D:  XWL1\par
105 X:   185.393 Y:   -77.479 Z:     8.220 D:  XWL1\par
106 X:   187.930 Y:   -80.446 Z:     8.465 D:  ZS1\par
107 X:   172.402 Y:   -81.378 Z:     7.723 D:  ZS2\par
108 X:   125.456 Y:   -62.205 Z:     4.396 D:  XWL1\par
109 X:    71.610 Y:   -48.159 Z:     0.607 D:  XWL1\par
110 X:    17.296 Y:   -33.802 Z:    -3.146 D:  XWL1\par
111 X:   -31.506 Y:   -21.425 Z:    -6.186 D:  XWL1\par
112 X:   -71.045 Y:   -11.313 Z:    -8.990 D:  XWL1\par
113 X:  -102.925 Y:    -2.920 Z:   -11.439 D:  XWL1\par
114 X:  -253.632 Y:    36.647 Z:   -19.411 D:  XWL1\par
115 X:   -95.926 Y:    -2.959 Z:   -10.997 D:  GRDRL\par
116 X:   -81.842 Y:    -6.558 Z:    -9.904 D:  GRDRL\par
117 X:   -72.198 Y:    -8.866 Z:    -9.037 D:  GRDRL\par
118 X:   -58.345 Y:   -11.552 Z:    -7.898 D:  GRDRL\par
119 X:   -58.626 Y:   -10.780 Z:    -7.666 D:  ZML1\par
120 X:   -70.593 Y:    -8.512 Z:    -7.506 D:  ZML1\par
121 X:   -78.208 Y:    -7.023 Z:    -7.703 D:  ZML1\par
122 X:   -49.797 Y:   -26.759 Z:    -7.294 D:  YL\par
123 X:   -49.897 Y:   -27.420 Z:    -7.294 D:  YL\par
124 X:   -53.155 Y:   -35.757 Z:    -7.493 D:  WL\par
125 X:  -101.361 Y:   -24.223 Z:   -11.056 D:  BRDG\par
126 X:    19.125 Y:   -60.250 Z:    -3.329 D:  GRDRL1\par
127 X:   -22.962 Y:   -28.477 Z:    -5.550 D:  ZS1\par
128 X:   -24.082 Y:   -28.187 Z:    -5.637 D:  ZS1\par
129 X:   -15.667 Y:   -25.409 Z:    -5.198 D:  ZS1\par
130 X:   -21.381 Y:   -23.834 Z:    -5.569 D:  ZS1\par
131 X:   -24.997 Y:   -22.910 Z:    -5.798 D:  ZS1\par
132 X:   -31.203 Y:   -21.156 Z:    -6.167 D:  XS3\par
133 X:   -32.069 Y:   -21.128 Z:    -6.199 D:  XS3\par
134 X:   -33.168 Y:   -21.084 Z:    -6.276 D:  XS3\par
135 X:   -24.266 Y:   -26.250 Z:    -5.701 D:  XS4\par
136 X:   -26.494 Y:   -25.305 Z:    -5.843 D:  XS4\par
137 X:   -28.968 Y:   -24.951 Z:    -5.996 D:  XS4\par
138 X:   -24.781 Y:   -27.151 Z:    -5.704 D:  XS5\par
139 X:   -25.866 Y:   -26.812 Z:    -5.778 D:  XS5\par
140 X:   -27.991 Y:   -26.062 Z:    -5.910 D:  XS5\par
141 X:   -24.900 Y:   -27.866 Z:    -5.684 D:  XS6\par
142 X:   -26.546 Y:   -27.136 Z:    -5.788 D:  XS6\par
143 X:   -25.476 Y:   -25.343 Z:    -5.802 D:  XGM1\par
144 X:   -24.116 Y:   -25.974 Z:    -5.708 D:  XGM1\par
145 X:   -26.121 Y:   -25.836 Z:    -5.834 D:  XGM2\par
146 X:   -24.388 Y:   -26.548 Z:    -5.714 D:  XGM2\par
147 X:   -47.074 Y:   -21.876 Z:    -7.159 D:  XS7\par
148 X:   -53.088 Y:   -22.358 Z:    -7.572 D:  XS7\par
149 X:   -60.622 Y:   -21.995 Z:    -8.134 D:  XS7\par
150 X:   -83.947 Y:   -21.004 Z:    -9.906 D:  XS7\par
151 X:   -95.877 Y:   -20.813 Z:   -10.777 D:  XS7\par
152 X:  -100.538 Y:   -20.478 Z:   -11.090 D:  XS7\par
153 X:   -92.489 Y:    -3.870 Z:   -10.816 D:  FLUID
```

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154 X:   -81.926 Y:    -6.587 Z:   -10.029 D:  FLUID\par
155 X:   -40.247 Y:     5.525 Z:    -6.863 D:  XML2\par
156 X:   -42.301 Y:    -2.905 Z:    -7.153 D:  XML2\par
157 X:   -46.622 Y:    -9.115 Z:    -7.546 D:  XML2\par
158 X:   -51.491 Y:   -11.847 Z:    -7.736 D:  XML2\par
159 X:   -55.467 Y:   -13.827 Z:    -7.844 D:  XML2\par
160 X:   -21.526 Y:   -18.271 Z:    -6.166 D:  XML3\par
161 X:   -25.094 Y:   -10.559 Z:    -6.540 D:  XML3\par
162 X:   -27.221 Y:    -1.923 Z:    -6.704 D:  XML3\par
163 X:   -26.540 Y:     8.401 Z:    -6.557 D:  XML3\par
164 X:   -56.468 Y:    -9.270 Z:    -8.137 D:  BAT\par
165 X:   -73.183 Y:    -5.081 Z:    -9.714 D:  BAT\par
166 X:   -55.131 Y:   -13.939 Z:    -7.808 D:  EOA\par
167 X:   -13.225 Y:   -14.790 Z:    -7.470 D:  DITCH\par
168 X:    20.986 Y:   -64.007 Z:    -4.353 D:  RM2
}
```

```
C:\\Forensic Scenes\\Tpr. Heath Sears\\09-0105A024-1    Job Description: \par
08:00:22 0[redacted]                                                   Page No.: 1\par
--------------------------------------------------------------------------------\par
===========================================================================\par
                        Traverse Print Out\par
===========================================================================\par
Job Description:   Crew:      Inst:     Temp:     Press:\par
                                                            \par
--Evidence Recorder v5.0.0\par
--Evidence Recorder v5.0.0\par
JB,NM09-0105A,DT12-08-2004,TM01:16:50\par
MO,AD0,UN2,SF1.000000,EC0,EO0.0,AU0\par
--Instrument Selected: Total Station, Profile: SRX, Model: SRX\par
--Instrument Selected: Total Station, Profile: SRX, Model: SRX\par
SP,PN1,N 0.0000,E 0.0000,EL0.0000,--RP\par
Store Point record, pt num = 1\par
x=0.000000, y=0.000000, z=0.000000, desc=RP\par
--Orientation\par
--Orientation\par
LS,HI5.100,HR5.100\par
OC,OP1,N 0.0000,E 0.0000,EL0.0000,--RP\par
BK,OP1,BP0,BS161.47270,BC161.47270\par
Setup   Backsight   BS Azimuth      BS Reading      Instrument Height\par
1         0         N/A             161.4727        5.100 \par
1 X:     0.000 Y:     0.000 Z:     0.000 D:  RP\par
BR,OP1,BP0,AR161.47270,ZE93.41370,SD67.4999\par
SS,OP1,FP99,AR161.47270,ZE93.41370,SD67.4999,--RM1\par
Pt#   HZAngle   SlpDist  VTAng   ParOff   PerpOff TgtHt  Description\par
99 161.4727   67.500  93.4137 0.000    0.000   5.100  RM1\par
LS,HI5.100,HR5.100\par
OC,OP1,N 0.0000,E 0.0000,EL0.0000,--RP\par
BK,OP1,BP99,BS161.47270,BC161.47270\par
Setup   Backsight   BS Azimuth      BS Reading      Instrument Height\par
1         99        N/A             161.4727        5.100 \par
1 X:     0.000 Y:     0.000 Z:     0.000 D:  RP\par
99 X:    21.049 Y:   -63.986 Z:    -4.348 D:  RM1 CITY LIMIT\par
BR,OP1,BP99,AR161.47270,ZE93.41370,SD67.4999\par
--Orientation Notes\par
--Orientation Notes\par
--  Observed Values:     HA 161°47'27" VA 93°41'37" SD 67.50' HD 67.36' HR 5.10'\par
--  Observed Values:     HA 161°47'27" VA 93°41'37" SD 67.50' HD 67.36' HR 5.10'\par
--  Observed Reference:  Direction (Point Stored)\par
--  Observed Reference:  Direction (Point Stored)\par
LS,HI5.100,HR7.000\par
SS,OP1,FP100,AR107.56310,ZE87.45390,SD460.4991,--XWL1\par
Pt#   HZAngle   SlpDist  VTAng   ParOff   PerpOff TgtHt  Description\par
100 107.5631  460.499  87.4539 0.000    0.000   7.000  XWL1\par
LS,HI5.100,HR8.000\par
SS,OP1,FP101,AR108.22320,ZE87.29520,SD409.1992,--XWL1\par
101 108.2232  409.199  87.2952 0.000    0.000   8.000  XWL1\par
SS,OP1,FP102,AR109.01040,ZE87.14450,SD352.9993,--XWL1\par
102 109.0104  352.999  87.1445 0.000    0.000   8.000  XWL1\par
LS,HI5.100,HR5.100\par
SS,OP1,FP103,AR109.49460,ZE87.34380,SD301.3994,--XWL1\par
103 109.4946  301.399  87.3438 0.000    0.000   5.100  XWL1\par
SS,OP1,FP104,AR110.58350,ZE87.31320,SD250.3995,--XWL1\par
104 110.5835  250.399  87.3132 0.000    0.000   5.100  XWL1\par
SS,OP1,FP105,AR112.40510,ZE87.39270,SD201.0996,--XWL1\par
105 112.4051  201.100  87.3927 0.000    0.000   5.100  XWL1
```

```
SS,OP1,FP106,AR113.10260,ZE87.37440,SD204.5996,--ZS1\par
106 113.1026  204.600  87.3744 0.000    0.000   5.100  ZS1\par
SS,OP1,FP107,AR115.16070,ZE87.40490,SD190.7996,--ZS2\par
107 115.1607  190.800  87.4049 0.000    0.000   5.100  ZS2\par
SS,OP1,FP108,AR116.22250,ZE88.12070,SD140.0997,--XWL1\par
108 116.2225  140.100  88.1207 0.000    0.000   5.100  XWL1\par
SS,OP1,FP109,AR123.55160,ZE89.35500,SD86.2998,--XWL1\par
109 123.5516   86.300  89.3550 0.000    0.000   5.100  XWL1\par
SS,OP1,FP110,AR152.54050,ZE94.44100,SD38.0999,--XWL1\par
110 152.5405   38.100  94.4410 0.000    0.000   5.100  XWL1\par
SS,OP1,FP111,AR235.46590,ZE99.13200,SD38.5999,--XWL1\par
111 235.4659   38.600  99.1320 0.000    0.000   5.100  XWL1\par
SS,OP1,FP112,AR260.57080,ZE97.07220,SD72.4999,--XWL1\par
112 260.5708   72.500  97.0722 0.000    0.000   5.100  XWL1\par
SS,OP1,FP113,AR268.22300,ZE96.20220,SD103.5998,--XWL1\par
113 268.2230  103.600  96.2022 0.000    0.000   5.100  XWL1\par
SS,OP1,FP114,AR278.13180,ZE94.19540,SD256.9995,--XWL1\par
114 278.1318  257.000  94.1954 0.000    0.000   5.100  XWL1\par
SS,OP1,FP115,AR268.14000,ZE96.32120,SD96.5998,--GRDRL\par
115 268.1400   96.600  96.3212 0.000    0.000   5.100  GRDRL\par
SS,OP1,FP116,AR265.25070,ZE96.52410,SD82.6998,--GRDRL\par
116 265.2507   82.700  96.5241 0.000    0.000   5.100  GRDRL\par
SS,OP1,FP117,AR262.59570,ZE97.04540,SD73.2999,--GRDRL\par
117 262.5957   73.300  97.0454 0.000    0.000   5.100  GRDRL\par
SS,OP1,FP118,AR258.48040,ZE97.33500,SD59.9999,--GRDRL\par
118 258.4804   60.000  97.3350 0.000    0.000   5.100  GRDRL\par
SS,OP1,FP119,AR259.34520,ZE97.19420,SD60.0999,--ZML1\par
119 259.3452   60.100  97.1942 0.000    0.000   5.100  ZML1\par
SS,OP1,FP120,AR263.07290,ZE96.01330,SD71.4999,--ZML1\par
120 263.0729   71.500  96.0133 0.000    0.000   5.100  ZML1\par
SS,OP1,FP121,AR264.52070,ZE95.36110,SD78.8998,--ZML1\par
121 264.5207   78.900  95.3611 0.000    0.000   5.100  ZML1\par
SS,OP1,FP122,AR241.44540,ZE97.21080,SD56.9999,--YL\par
122 241.4454   57.000  97.2108 0.000    0.000   5.100  YL\par
SS,OP1,FP123,AR241.12350,ZE97.18030,SD57.3999,--YL\par
123 241.1235   57.400  97.1803 0.000    0.000   5.100  YL\par
SS,OP1,FP124,AR236.04170,ZE96.40150,SD64.4999,--WL\par
124 236.0417   64.500  96.4015 0.000    0.000   5.100  WL\par
SS,OP1,FP125,AR256.33350,ZE96.03200,SD104.7998,--BRDG\par
125 256.3335  104.800  96.0320 0.000    0.000   5.100  BRDG\par
SS,OP1,FP126,AR162.23200,ZE93.00520,SD63.2999,--GRDRL1\par
126 162.2320   63.300  93.0052 0.000    0.000   5.100  GRDRL1\par
SS,OP1,FP127,AR218.52460,ZE98.37360,SD36.9999,--ZS1\par
127 218.5246   37.000  98.3736 0.000    0.000   5.100  ZS1\par
SS,OP1,FP128,AR220.30360,ZE98.38440,SD37.4999,--ZS1\par
128 220.3036   37.500  98.3844 0.000    0.000   5.100  ZS1\par
SS,OP1,FP129,AR211.39300,ZE99.52420,SD30.2999,--ZS1\par
129 211.3930   30.300  99.5242 0.000    0.000   5.100  ZS1\par
SS,OP1,FP130,AR221.53410,ZE99.51580,SD32.4999,--ZS1\par
130 221.5341   32.500  99.5158 0.000    0.000   5.100  ZS1\par
SS,OP1,FP131,AR227.29420,ZE99.42120,SD34.3999,--ZS1\par
131 227.2942   34.400  99.4212 0.000    0.000   5.100  ZS1\par
SS,OP1,FP132,AR235.51420,ZE99.17240,SD38.1999,--XS3\par
132 235.5142   38.200  99.1724 0.000    0.000   5.100  XS3\par
SS,OP1,FP133,AR236.37190,ZE99.10120,SD38.8999,--XS3\par
133 236.3719   38.900  99.1012 0.000    0.000   5.100  XS3
```

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SS,OP1,FP134,AR237.33220,ZE99.04230,SD39.7999,--XS3\par
134 237.3322   39.800  99.0423 0.000    0.000   5.100  XS3\par
SS,OP1,FP135,AR222.45020,ZE99.03420,SD36.1999,--XS4\par
135 222.4502   36.200  99.0342 0.000    0.000   5.100  XS4\par
SS,OP1,FP136,AR226.18540,ZE99.03440,SD37.0999,--XS4\par
136 226.1854   37.100  99.0344 0.000    0.000   5.100  XS4\par
SS,OP1,FP137,AR229.15390,ZE98.54450,SD38.6999,--XS4\par
137 229.1539   38.700  98.5445 0.000    0.000   5.100  XS4\par
SS,OP1,FP138,AR222.23120,ZE98.49110,SD37.1999,--XS5\par
138 222.2312   37.200  98.4911 0.000    0.000   5.100  XS5\par
SS,OP1,FP139,AR223.58160,ZE98.49000,SD37.6999,--XS5\par
139 223.5816   37.700  98.4900 0.000    0.000   5.100  XS5\par
SS,OP1,FP140,AR227.02390,ZE98.47030,SD38.6999,--XS5\par
140 227.0239   38.700  98.4703 0.000    0.000   5.100  XS5\par
SS,OP1,FP141,AR221.47000,ZE98.38530,SD37.7999,--XS6\par
141 221.4700   37.800  98.3853 0.000    0.000   5.100  XS6\par
SS,OP1,FP142,AR224.22150,ZE98.40100,SD38.3999,--XS6\par
142 224.2215   38.400  98.4010 0.000    0.000   5.100  XS6\par
SS,OP1,FP143,AR225.09000,ZE99.10180,SD36.3999,--XGM1\par
143 225.0900   36.400  99.1018 0.000    0.000   5.100  XGM1\par
SS,OP1,FP144,AR222.52290,ZE99.08530,SD35.8999,--XGM1\par
144 222.5229   35.900  99.0853 0.000    0.000   5.100  XGM1\par
SS,OP1,FP145,AR225.18510,ZE99.01220,SD37.1999,--XGM2\par
145 225.1851   37.200  99.0122 0.000    0.000   5.100  XGM2\par
SS,OP1,FP146,AR222.34180,ZE99.00230,SD36.4999,--XGM2\par
146 222.3418   36.500  99.0023 0.000    0.000   5.100  XGM2\par
SS,OP1,FP147,AR245.04310,ZE97.51070,SD52.3999,--XS7\par
147 245.0431   52.400  97.5107 0.000    0.000   5.100  XS7\par
SS,OP1,FP148,AR247.09420,ZE97.29190,SD58.0999,--XS7\par
148 247.0942   58.100  97.2919 0.000    0.000   5.100  XS7\par
SS,OP1,FP149,AR250.03280,ZE97.11200,SD64.9999,--XS7\par
149 250.0328   65.000  97.1120 0.000    0.000   5.100  XS7\par
SS,OP1,FP150,AR255.57090,ZE96.31490,SD87.0998,--XS7\par
150 255.5709   87.100  96.3149 0.000    0.000   5.100  XS7\par
SS,OP1,FP151,AR257.45090,ZE96.16060,SD98.6998,--XS7\par
151 257.4509   98.700  96.1606 0.000    0.000   5.100  XS7\par
SS,OP1,FP152,AR258.29150,ZE96.10080,SD103.1998,--XS7\par
152 258.2915  103.200  96.1008 0.000    0.000   5.100  XS7\par
SS,OP1,FP153,AR267.36140,ZE96.39510,SD93.1998,--FLUID\par
153 267.3614   93.200  96.3951 0.000    0.000   5.100  FLUID\par
SS,OP1,FP154,AR265.24120,ZE96.57250,SD82.7998,--FLUID\par
154 265.2412   82.800  96.5725 0.000    0.000   5.100  FLUID\par
SS,OP1,FP155,AR277.49000,ZE99.35210,SD41.1999,--XML2\par
155 277.4900   41.200  99.3521 0.000    0.000   5.100  XML2\par
SS,OP1,FP156,AR266.04180,ZE99.34320,SD42.9999,--XML2\par
156 266.0418   43.000  99.3432 0.000    0.000   5.100  XML2\par
SS,OP1,FP157,AR258.56160,ZE99.01320,SD48.0999,--XML2\par
157 258.5616   48.100  99.0132 0.000    0.000   5.100  XML2\par
SS,OP1,FP158,AR257.02340,ZE98.19460,SD53.3999,--XML2\par
158 257.0234   53.400  98.1946 0.000    0.000   5.100  XML2\par
SS,OP1,FP159,AR256.00070,ZE97.48460,SD57.6999,--XML2\par
159 256.0007   57.700  97.4846 0.000    0.000   5.100  XML2\par
SS,OP1,FP160,AR229.40330,ZE102.19060,SD28.8999,--XML3\par
160 229.4033   28.900 102.1906 0.000    0.000   5.100  XML3\par
SS,OP1,FP161,AR247.10470,ZE103.30270,SD27.9999,--XML3\par
161 247.1047   28.000 103.3027 0.000    0.000   5.100  XML3
```

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SS,OP1,FP162,AR265.57340,ZE103.48080,SD28.0999,--XML3\par
162 265.5734   28.100 103.4808 0.000    0.000   5.100  XML3\par
SS,OP1,FP163,AR287.33510,ZE103.15110,SD28.5999,--XML3\par
163 287.3351   28.600 103.1511 0.000    0.000   5.100  XML3\par
SS,OP1,FP164,AR260.40370,ZE98.05330,SD57.7999,--BAT\par
164 260.4037   57.800  98.0533 0.000    0.000   5.100  BAT\par
SS,OP1,FP165,AR266.01430,ZE97.32360,SD73.9999,--BAT\par
165 266.0143   74.000  97.3236 0.000    0.000   5.100  BAT\par
SS,OP1,FP166,AR255.48390,ZE97.49050,SD57.3999,--EOA\par
166 255.4839   57.400  97.4905 0.000    0.000   5.100  EOA\par
SS,OP1,FP167,AR221.48100,ZE110.37490,SD21.2000,--DITCH\par
167 221.4810   21.200 110.3749 0.000    0.000   5.100  DITCH\par
SS,OP1,FP168,AR161.50500,ZE93.41500,SD67.4999,--RM2\par
168 161.5050   67.500  93.4150 0.000    0.000   5.100  RM2
}
```

[redacted]

Original Incident (CAD) Number:	[redacted]
County:	
Date:	
Time:	
Location:	

All Drivers Involved:

Driver #:	First Name	Middle	Last Name
[redacted]			

Original Investigating Officer:	Cpl. C. O. Tubbs
Troop Reconstructionist(s):	NA
Assisting Officer(s):	NA
Assisting Agency(ies):	NA
Level IV Reconstructionist(s):	Sgt. H. A. Sears
Date of Report:	05-04-2009

[redacted]

Contents

[redacted]

Section I - Synopsis

On Wednesday, [redacted] the Major Crash Investigation Unit, Team #1, was notified of a fatality motor vehicle accident involving felony charges that had occurred on [redacted], in Clay County, Missouri. Sergeant H. A. Sears was assigned to the case that had been initiated by Corporal C. O. Tubbs who also submitted the original report of the collision, indicating that it occurred on Missouri 92 (MO 92), 0.5 mile west of US 169. The accident involved two vehicles with one fatality.

The collision involved a red 1990 Lincoln bearing Missouri registration [redacted]#1. He was injured in the crash.

The accident also involved a black 2003 Ford truck bearing Missouri registration [redacted], driven by registered [redacted] #2. He was injured and later died from injuries sustained in the crash.

The collision occurred as Vehicle #1 was [redacted] when it struck the front driver's side of Vehicle #2, which was [redacted] a private drive located north of the highway. After impact, Vehicle #1 crossed the centerline, hit a bridge wall, and came to rest in the [redacted] lane on First [redacted]. Vehicle #2 rotated clockwise, struck two bridge marker signs, and slid up the bridge guardrail coming to rest partially on the guardrail and in the westbound lane of MO 92.

[redacted]

Section II - Environmental Factors

This collision occurred on MO 92, classified as part of the state-numbered highway system, and designated an east-west route, consisting of a single asphalt roadway measuring approximately 20 feet wide and separated into two lanes of traffic by two continuous yellow paint lines aligned near the roadway centerline which prohibit passing in either direction. Both lanes of traffic are bordered on the outside by continuous white paint lines and narrow gravel shoulders measuring about 1.5 feet in width. The westbound lane is additionally bordered by a grass ditch situated approximately 10 feet to the north that parallels the roadway and which rises steeply to the north, to form a grass embankment.

In the area of the crash, the westbound traffic follows a downhill course of approximately 4 percent grade before leveling off somewhat prior [redacted] and a private drive that intersects MO 92 from the north just east of the bridge. Sight distance to the private drive for westbound drivers extends about 480 feet.

DSC6.JPG - View of crash scene, looking west

DSC14.JPG - View of crash scene, looking east

The frictional characteristics of the MO 92 asphalt roadway were measured by Sgt. Sears on March 5, 2009, using a drag sled with a representative vehicle tire patch attached to its base weighing approximately 32 pounds. Pulls of 19.5 pounds were recorded in the direction of vehicle pre- and post-impact travel to the west, resulting in a

[redacted]

frictional coefficient of 60.9 percent (.609) of the constant decelerative force of gravity on that surface.

The collision occurred just after noon, during the hours of daylight, with clear skies and no precipitation or other factors that would adversely affect driver visibility.

The roadway is maintained by the Missouri Department of Transportation, Jefferson City, and has a posted speed limit of 55 miles per hour. The crash location is approximately 50 feet west of the west Smithville City Limit. Global positioning system coordinates for the collision location are [redacted]

[redacted]

Section III - Mechanical Factors

Both vehicles were photographed and examined by Sgt. Sears, with the assistance of Sergeant G. Q. Billings, [redacted], Vehicle #1 at Clower's body Shop in Smithville, and Vehicle #2 at Co-Part Salvage yard in Edwardsville, Kansas. Vehicle #2 had initially been towed to All Star Tow in Tracy, Missouri, before being transferred.

Vehicle #1, identified in Section I, was a red 1990 Lincoln Mark VII LSC two-door coupe with 19,182 miles registered on its odometer at the time of examination. It was equipped with a driver's side air bag that had deployed[1] and integrated lap and shoulder seat belt restraints for the driver's position that extended and latched when checked for operability. Vehicle #1 exhibited massive front-end damage.

The Vehicle #1 front bumper was forced rearward and folded just over two feet to the right of the left front corner. Front-end and engine components were forced rearward over two feet on the passenger side and over three feet on the driver's side. The Vehicle #1 hood was crumpled and forced upward and rearward, and its roof was crumpled in two places along its front edge. The left front quarter panel was completely detached, while the right front remained, but was crumpled along its entire length. Both headlight assemblies were completely detached. The Vehicle #1 driver's door front and window frame was forced rearward and outward, and the driver's side "A" pillar, that vehicle member at which the door hinges, was forced rearward about 1.5 feet. Interior dash components were forced rearward, as well. The car body behind the rear axle was forced downward and body components on both sides were crumpled to the rear quarter panels.

The Vehicle #1 windshield was partially detached and completely cracked. The remaining vehicle glass was completely gone except the rear driver's side window, which

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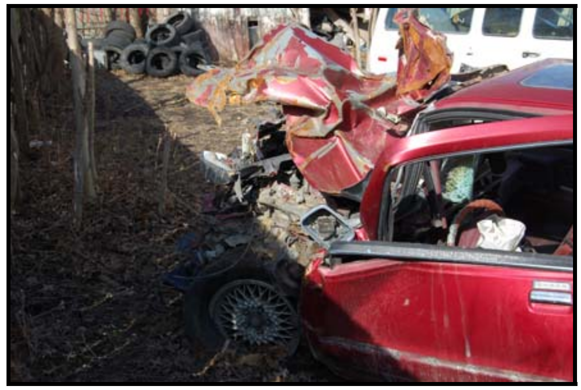
[1] The original report indicates that the driver's air bag had not deployed. When Vehicle #1 was examined and photographed at Clower's Body Shop on [redacted] the air bag appeared to have deployed or was pulled out by someone else investigating the crash.

remained intact. The left front tire was deflated while the remaining Vehicle #1 tires remained inflated.

DSC20.JPG - View of Vehicle #1 from right front



DSC24.JPG - View of Vehicle #1 left front

On [redacted], the Vehicle #1 right rear wheel was removed by Sgt. Sears in order to examine the right rear disc brake. The brake pad appeared thick and remained in contact with the disc, which also appeared in good condition. No evidence that the Vehicle #1 rear brakes were “anti-lock” equipped was observed.

DSC40.JPG - View of Vehicle #1 right rear disc brake

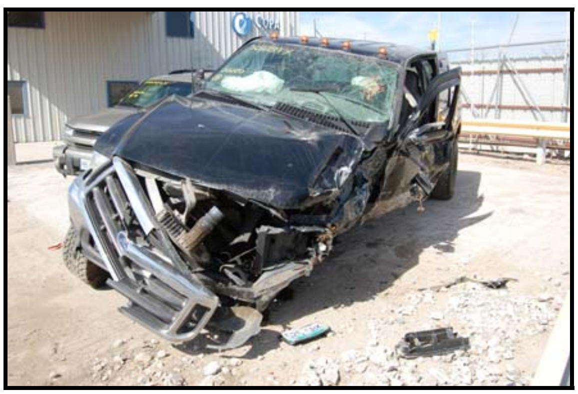
DSC42.JPG - View of Vehicle #1 disc brake

Vehicle #1 was not weighed. However, manufacturer specifications indicate it should have weighed 3615 pounds. The additional weight of the driver should have increased its weight at the time of the collision to around 3745 pounds, according to computerized Missouri Department of Revenue driver’s license files.

[redacted]

Vehicle #2, identified in Section I, was a black 2003 Ford F-350 Super-duty Crew Cab equipped with dual front air bags that had deployed and with integrated lap and shoulder seat belt restraints for the driver's position that were locked in the retracted position, indicative of non-use. It exhibited extensive collision damage to its driver's side.

The Vehicle #2 grille was broken and partially detached, and the left side of the front bumper was forced inward and downward. The radiator was forced forward and to the right at its left side, and the left headlight assembly was completely detached. The Vehicle #1 driver's side from the left front quarter panel, including the portion of the hood above it, to the rear driver's side door, was completely crumpled. The left rear corner of the truck bed was scraped and the left brake light cover was broken.



DSC28.JPG - View of Vehicle #2 from left front

DSC29.JPG - View of Vehicle #2 front left driver's side

All Vehicle #2 glass remained intact except for the driver's door window that was completely gone. The left front wheel was completely detached, and the left rear tire was deflated, but the right side tires remained inflated.

The Vehicle #2 RCM (Restraint Control Module) was downloaded on [redacted], at Co-Part Salvage, and a copy of the downloaded data is included as an attachment to this report, and discussed in Section VI - Findings.

Vehicle #2 was not weighed. However, manufacturer specifications indicate it should have weighed 6339 pounds. The additional weight of the driver should have

[redacted]

increased its weight at the time of the collision to around 6517 pounds according to computerized Missouri Department of Revenue driver’s license files.

[redacted]

Section IV - Human Factors

[redacted]

[redacted]

Section V - Scene Investigation

The scene of the collision was examined and photographed by Sgt. Sears on [redacted] with the assistance of Sgt. G. Q. Billings, at which time it was also charted using assigned electronic mapping instruments. Measurements referred to in this report are from information generated from computer graphics gathered by the mapping instruments, unless noted. (Vehicle final rest measurements were taken from measurements obtained at the scene of the crash by Cpl. R. V. Meade).

A measurement reference line was established across and perpendicular to the MO 92 roadway at the location of the east end of the [redacted] Roadway edges and paint lines also serve as supplemental reference lines in descriptions below. Directional references are according to nominal directions of travel rather than to actual real-world bearings, unless noted.

Vehicle #1 came to rest upright in a west facing in the eastbound lane on [redacted]. Its left front corner was approximately 9 feet west of the reference line and about one-half foot south of the eastbound white line. The Vehicle #1 left rear corner was approximately 3 feet east of the reference line and about one foot north of the white line.

Vehicle #2 came to rest upright in a northeast facing, its front-end partially on top of the guardrail north of the roadway, extending rearward into the westbound lane. Its right front corner was approximately 18 feet east of the reference line and about 4 feet north of the westbound white line. The Vehicle #2 right rear corner was approximately one foot east of the reference line and about 7 feet south of the white line.

A pair of pre-impact tire marks attributable to the Vehicle #1 front tires was observed in the westbound lane and gave indication of its travel prior to the collision. The right front mark began approximately 294 feet east of the reference line and about 2 feet south of the westbound white line while the left front mark became visible approximately 279 feet east of the reference line and about 7 feet south of the white line. The marks were fairly straight and led into the area of impact where the right front ended on the white line approximately 73 feet east of the reference line and the left front approximately 76 feet east of the reference line and about 5 feet south of the white line.

DSC6.JPG - View of Vehicle #1 pre-impact tire marks in westbound lane

DSC8.JPG - View of Vehicle #1 left front pre-impact tire mark end

A tire mark, measuring about 3.5 feet in length, attributable to the Vehicle #1 left front tire after impact with Vehicle #2 was observed in the westbound lane. It began approximately 75 feet east of the reference line and about 4.3 feet south of the westbound white line.

A tire scrub mark, measuring about 5 feet in length, attributable to the Vehicle #2 front left tire during impact events, was observed in the westbound lane. It began approximately 75 feet east of the reference line and about 3 feet south of the westbound white line. Two gouges were observed on either side of the scrub mark measuring about 2 feet in length each, and were attributable to the Vehicle #2 left front tire rim.

DSC9.JPG - View of Vehicle #1 front left pre- and post-impact tire marks and Vehicle #2 left front post-impact tire mark and gouges in the westbound lane, looking west

A tire mark, attributable to the Vehicle #2 left rear tire during post-collision travel was observed in the westbound lane. It became visible approximately 52 feet east of the reference line and about 4 feet south of the westbound white line and curved toward the northwest, ending near the position of Vehicle #2 at final rest. (This mark was originally charted as leading toward the position of Vehicle #1 at final rest, was later determined to be the first portion of the Vehicle #2 left rear tire mark evident in the digital image below).

[redacted]

DSC10.JPG - Arrows point to Vehicle #2 left rear post-impact tire mark

[redacted]

Section VI - Findings

Using computer generated graphics of the collision scene based on information gathered by the mapping instruments, as well as evidence observed during examination of the scene and of the damaged vehicles, and driver and witness statements, determinations were reached regarding the crash situation, also graphically depicted in the attached scale diagram.

Tire and gouge mark evidence along with graphic analysis indicates the collision occurred in [redacted] lane, the Vehicle #1 right side tires on the westbound white line nearly aligned with the westbound heading of the road, and the Vehicle #2 front-end approximately 6.5 feet into the lane or south of the white line about 24 degrees counter-clockwise from the south heading of the driveway, its rear-end on the driveway, about 12 feet north of the white line.

Damage to the vehicles and evidence on the roadway indicate the Vehicle #1 front center struck Vehicle #2 on the driver's side about 2.5 feet rear of the left front corner. The impact forced Vehicle #2 to rotate in a clockwise direction as Vehicle #1 continued in the west direction through collision, the Vehicle #2 driver's side striking the Vehicle #1 passenger side as it rotated, causing Vehicle #1 to course to the southwest towards the south bridge wall where it came to rest. Vehicle #2 continued to rotate as it was forced west, its front wheels sliding north of a metal guardrail situated just north of the roadway, its undercarriage behind the front axle sliding onto the top of the guardrail as its rear-end rotated clockwise toward the east end of the north bridge wall, its front undercarriage on the guardrail, where it came to rest.

Math computations indicate Vehicle #1 traveled to final rest at a speed of approximately 29.8 miles per hour, while Vehicle #2 rotated to the west at a speed of about 25.2 miles per hour.

[redacted]

Math computations also indicate Vehicle #1 was traveling approximately 96 miles per hour at the beginning of its pre-impact tire marks and 73 miles per hour at impact with Vehicle #2.[2]

Further computations indicate Driver #1 experienced a motion change at impact, or delta-V, of approximately 44 miles per hour, while that experienced by Driver #2 was between 25 and 32 miles per hour.[3]

The highest delta-V recorded by the Vehicle #2 SDM indicates a speed of 10.84 miles per hour 66 milliseconds into the collision. This particular RCM records delta-V in the longitudinal direction only, and as Vehicle #2 began rotating clockwise at impact, it therefore is only a partial description of motion change.

Driver #2 was most likely ejected out the driver's side window immediately after the collision as his truck was forced to the west and rotated clockwise by the force of the impact.

[2] These speeds are based on a range of possible Vehicle #2 impact speeds between 0 and 10 miles per hour, and reflect the low end. A Vehicle #2 impact speed of 10 miles per hour, results in a Vehicle #1 impact speed of 91 miles per hour.
[3] Again, this range of delta-V speeds is based on the range of possible Vehicle #2 impact speeds between 0 and 10 miles per hour.

Section VII - Event Analysis

According to determinations reached in this report, this crash occurred as the result of the high speed Vehicle #1 was traveling after cresting a hill on MO 92 at the same time Driver #2 was attempting to turn east onto the highway from a private drive north of the roadway. The collision was of sufficient force to eject unrestrained Driver #2 from his truck, killing him.

The fact that Driver #1 survived the collision considering a very substantial motion change, can be attributed to his use of seat belt restraints and the deployment of his car’s driver’s side air bag, which prevented his upper body and head from violently contacting the forward interior components of his car as they were forced rearward during impact events. Had Driver #2 been making use of the available seat belt restraints in his truck, he should not have been ejected and likely would have survived the collision, considering the lack of intrusion into his occupant space by vehicle components.

Math computations indicate Driver #1 was approximately 434 feet east of impact when he observed Vehicle #2 pulling into his lane and began to react by moving his foot from the accelerator pedal to the brake pedal.[4] He actually reacted about as quickly as could be expected after cresting the hill and first having a view of Vehicle #2, but the speed he was traveling made it impossible to slow enough and/or avoid the collision. Had he been traveling the posted speed limit of 55 miles per hour, Driver #1 could have completely stopped his car almost 50 feet east of the area of impact. At 55 miles per hour, Vehicle #1 would require over 5 seconds to travel the 434 feet to impact, while Vehicle #2 could have been driven from the private drive to a position completely in the eastbound lane in well under 5 seconds, and thus avoid the accident entirely.

[4] According to studies conducted by Dr. Paul Olsen, daytime drivers typically require approximately 1.6 seconds between the time they perceive a hazard to the time their vehicle’s dynamics are changed by a braking response.

[redacted]

Driver #2 probably completely stopped his truck halfway into the westbound lane when he observed Vehicle #1 traveling down the hill toward him at such a high rate of speed, but did not have any substantial amount of time to back his truck into the drive before impact or accelerate to attempt to clear the lane.

Section VIII - Attachments

1. Photo Log
2. Scale Diagram
3. Math Computations
4. Copy of downloaded RCM data from 2003 Ford F-350
5. Copy of Expert AutoStats manufacturer specifications for 1990 Lincoln Mark VII and 2003 Ford F-350

Reporting Officer

Reviewing Officer

[redacted]

Photo Log

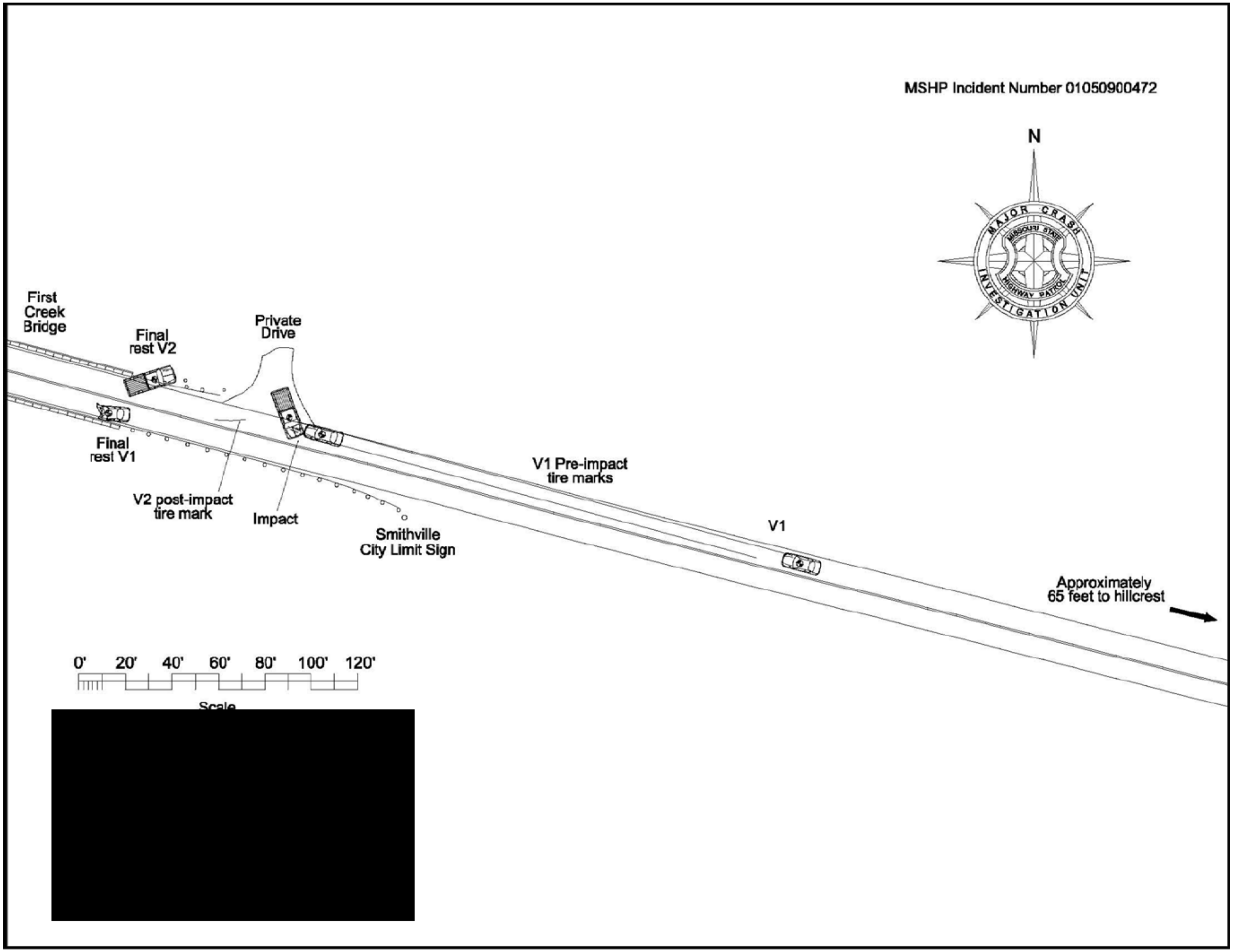
All digital images were taken by Sgt. Sears. DSC1.JPG through DSC16.JPG were taken at the scene of the crash on [redacted]. DSC17.JPG through DSC25.JPG were taken on [redacted] at Clower's Body Shop in Smithville, Missouri. DSC26.JPG through DSC38.JPG were taken at Co-part Salvage in Edwardsville, Kansas, on March 5, 2009. DSC39.JPG through DSC43.JPG were taken at Clower's Body Shop on [redacted]

Directional references are according to nominal directions of travel rather than to actual real-world bearings, unless noted.

1. View of the crash scene, looking westbound
2. Progressive view from previous view
3. View of the crash scene, looking westbound, with a view of a patrol truck in a driveway just north of the area of impact
4. Progressive view from previous view
5. Progressive view from previous view
6. View of Vehicle #1 pre-impact tire marks, looking westbound
7. Progressive view from previous view
8. View of tire marks, scrub marks and gouges at the area of impact, looking westbound
9. Close-up view of tire scrub marks and gouges
10. View of the area of vehicle post-impact travel, looking westbound
11. View of guardrail upon which Vehicle #2 came to rest
12. View of the guardrail, looking north
13. View of the south bridge wall, Vehicle #1 came to rest just north of it
14. View of the crash scene, looking eastbound
15. View looking east from the driveway just north of the area of impact. Image taken from the driver's seat of patrol truck

16. View looking east from the edge of the driveway north of the impact area. Image taken from the patrol truck driver’s seat
17. View of Vehicle #1 from the left rear
18. View of the Vehicle #1 rear
19. View of Vehicle #1 from the right rear
20. View of Vehicle #1 from the right front
21. View of the Vehicle #1 front
22. Close-up of damage to the Vehicle #1 front
23. View of the Vehicle #1 left front
24. View of the Vehicle #1 left front
25. View of the Vehicle #1 interior from the driver’s side
26. View of Vehicle #2 from the right front
27. View of the Vehicle #2 front
28. View of Vehicle #2 from the left front
29. View of the Vehicle #2 left front driver’s side
30. View of the Vehicle #2 driver’s side
31. View of Vehicle #2 from the left rear
32. View of the Vehicle #2 rear
33. View of Vehicle #2 from the right rear
34. View of the Vehicle #2 interior from the front passenger door
35. View of damage and paint transfer to the left corner of the Vehicle #2 front bumper
36. View of damage and paint transfer to the lower Vehicle #2 driver’s door
37. View of the Vehicle #2 interior through the driver’s window
38. View of damage and paint transfer to Vehicle #2 behind the left front wheel cut-out and lower portion of the driver’s door
39. View of the Vehicle #1 left rear disc brake
40. View of the Vehicle #1 left rear disc brake
41. View of Vehicle #1 and its removed left rear wheel
42. View behind the Vehicle #1 left rear disc brake
43. View behind the Vehicle #1 left rear disc brake

[redacted]



[redacted]

[redacted]

Math Computations

Item I:

Computation to determine the frictional coefficient of the MO 92 roadway in the area of the collision, using the following generally accepted formula:

$$f = \frac{F}{W}$$

Where *F* is the forced required to maintain movement of the drag sled once motion is achieved, and *W* is the weight of the sled, 32 pounds.

Pulls averaging 19.5 pounds were recorded on the asphalt pavement in the direction of vehicle post-impact travel and in the direction of Vehicle #1 pre-impact travel:

$$f = \frac{19.5}{32}$$

$$= .609375$$

$$= .609$$

Item II:

Computation to determine μ, the adjusted deceleration factor applicable to Vehicle #1 post-impact travel. The percentage of overall vehicle weight at the locked and sliding front tires, .56, is combined with the frictional coefficient of the roadway, .609. This is added to the combination of the percentage of remaining vehicle weight at the rear tires, .44, and a commonly accepted decelerative value for free-rolling tires, .02:

$$\mu = (.56 \times .609) + (.44 \times .02)$$

$$= .34104 + .0088$$

$$= .34984$$

$$.349$$

[redacted]

Item III:

Computation to determine the Vehicle #1 post-impact speed, using the following generally accepted formula:

$$S = \sqrt{30 \times D \times \mu}$$

Where *30* is a mathematical constant; *D* is the distance Vehicle #1 traveled to final rest, 85 feet; and μ is the adjusted decelerative value for Vehicle #1 post-impact travel, .349:

$$\begin{aligned} S &= \sqrt{30 \times 85 \times .349} \\ &= \sqrt{889.95} \\ &= 29.83202 \\ &= 29.8 mph \end{aligned}$$

Item IV:

Computation to determine, μ_2, the deceleration factor applicable to Vehicle #2 post-impact travel on the metal guardrail. First, the slope percentage is determined by dividing the height of the guardrail, 1.8 feet, by the distance the Vehicle #2 center of gravity was behind its front axle, 5.5 feet:

$$\begin{aligned} \frac{1.8}{5.5} &= .3272727 \\ &= .327 \end{aligned}$$

This is combined with the percentage of weight at the Vehicle #2 rear axle, .40:

$$.327 \times .40 = .13$$

Therefore, the percentage of vehicle weight sliding on the guardrail, .87, is combined with a commonly accepted decelerative value for metal on metal, .1. This is added to the combination of the percentage of vehicle weight at the rear tires, .13, combined with the frictional coefficient of the roadway, .609, and a commonly accepted decelerative value for rotating vehicles, .7:

[redacted]

$$\mu_2 = (.87 \times .1) + (.13 \times .609 \times .7)$$
$$= .087 + .055419$$
$$= .142419$$
$$= .142$$

Item V:

Computation to determine the Vehicle #2 post-impact speed using the following generally accepted formula:

$$S = \sqrt{30[(D_1 \times \mu_2) + (D_2 \times f \times .7)]}$$

Where *30* is a mathematical constant; D_1 is the post-impact distance traveled by Vehicle #2 on the metal guardrail, 17 feet; μ_2, is the decelerative value applicable to post-impact travel on the guardrail, .142; D_2 is the post-impact distance traveled by Vehicle #2 prior to the guardrail, 44 feet; f is the frictional coefficient of the roadway, .609; and *.7* is a commonly accepted decelerative value for a rotating vehicle:

$$S = \sqrt{30[(17 \times .142) + (44 \times .609 \times .7)]}$$
$$= \sqrt{30[2.414 + 18.7572]}$$
$$= \sqrt{30[21.1712]}$$
$$= \sqrt{635.136}$$
$$= 25.2019$$
$$= 25.2 mph$$

[redacted]

Item VI:

Computation to determine the Vehicle #1 impact speed using the following generally accepted in-line momentum formula:

$$S_1 W_1 - S_2 W_2 = S_1' W_1 + S_2' W_2$$

With the values:

S_1: the Vehicle #1 impact speed, to be determined

S_2: the Vehicle #2 impact speed. A range of speeds is considered here between 0 and 10 mph

S'_1: the Vehicle #1 post-impact speed, 29.8 mph

S'_2: the Vehicle #2 post-impact speed, 25.2 mph

W_1: the Vehicle #1 weight with occupant, 3745 pounds

W_2: the Vehicle #2 weight with occupant, 6517 pounds

Inserting values:

$$S_1 3745 - (0)6517 = (29.8)3745 + (25.2)6517$$

$$S_1 3745 - 0 = 111601 + 1642228.4$$

$$S_1 3745 = 275829.4$$

$$\frac{S_1 3745}{3745} = \frac{275829.4}{3745}$$

$$S_1 = 73.6527$$

$$= 73.6 mph$$

A Vehicle #2 impact speed of 10 miles per hour results in a Vehicle #1 impact speed of approximately 91 miles per hour.

[redacted]

Item VII:

Computation to determine the Vehicle #1 speed at the beginning of its visible tire marks in the westbound lane, using the following generally accepted formula:

$$S = \sqrt{S_o^2 + (30 \times D \times f)}$$

Where S_o is the Vehicle #1 impact speed, 73.6 miles per hour; *30* is a mathematical constant; *D* is the distance traveled by Vehicle #1 from the beginning of its visible tire marks to impact, 215 feet; and *f* is the frictional coefficient of the roadway, .609:

$$\begin{aligned} S &= \sqrt{73.6^2 + (30 \times 215 \times .609)} \\ &= \sqrt{5424.7217 + 3928.05} \\ &= \sqrt{9352.771732} \\ &= 96.7097 \\ &= 96.7 mph \end{aligned}$$

[redacted]

Item VIII:

Computation to determine the amount of time required by Vehicle #1 to travel from the beginning of its visible tire marks to impact, using the following generally accepted formula:

$$t = \frac{.0455(S_o - S_f)}{\mu}$$

Where *.0455* is a mathematical constant; S_o is the Vehicle #1 speed at the beginning of its tire marks, 93.6 miles per hour; S_f is the vehicle #1 impact speed; and μ is the deceleration factor applicable to this portion of pre-impact travel, .517:

$$t = \frac{.0455(93.6 - 73.6)}{.517}$$

$$= \frac{.0455(20)}{.517}$$

$$= \frac{.91}{.517}$$

$$= 1.76\,\text{sec}$$

Item IX:

Computation to determine the distance Vehicle #1 was from impact 1.6 seconds prior to the beginning of its visible tire marks, using the following generally accepted formula:

$$D = 1.466 \times S \times t$$

Where *1.466* is a mathematical constant; S is the Vehicle #1 speed at the beginning of its tire marks, 93.6 miles per hour; and t is perception/reaction time, 1.6 seconds:

$$D = 1.466 \times 93.6 \times 1.6$$

$$= 219.548$$

$$= 219 ft$$

This is added to the Vehicle #1 skid distance of 215 feet resulting in a total distance of 434 feet.

[redacted]

Item X:

Computation to determine the motion change in miles per hour undergone by Driver #1 during the collision, using the following generally accepted formula:

$$\Delta V_1 = \sqrt{S_1^2 + S_1'^2 - 2S_1S_1'\cos\theta}$$

Where S_1 is the Vehicle #1 impact speed, 73.6 miles per hour; S'_1 is the Vehicle #1 post-impact speed, 29.8 miles per hour; *2* is a mathematical constant; and *cos* θ is the cosine of the angle of Vehicle #1 departure from impact, 5 degrees, or .996:

$$\begin{aligned}\Delta V_1 &= \sqrt{73.6^2 + 29.8^2 - 2(73.6)(29.8).996} \\ &= \sqrt{5416.96 + 888.04 - 4369.86} \\ &= \sqrt{1935.13} \\ &= 43.9901 \\ &= 44mph\end{aligned}$$

Using the same formula, inserting the Vehicle #2 values and the range of impact speeds between 0 and 10 miles per hour results in a range of delta-V speeds between 25.2 and 32.1 miles per hour.

[redacted]

Item XI:

Computation to determine the time required by Vehicle #2 to travel from the private drive to a position completely in the eastbound lane, using the following generally accepted formula:

$$t = .249\sqrt{\frac{D}{a}}$$

Where *.249* is a mathematical constant; *D* is the distance to complete the turn into the eastbound lane, 55 feet; and *a* is an average acceleration factor for this type truck, .15:

$$\begin{aligned} t &= .249\sqrt{\frac{55}{.15}} \\ &= .249\sqrt{366.66} \\ &= .249 \times 19.148 \\ &= 4.7679 \\ &= 4.7\,\text{sec} \end{aligned}$$

Item XII:

Computation to determine the time required by Vehicle #1 to travel the distance from the point Driver #1 observed Vehicle #2 to impact had he been traveling at the posted speed limit, 55 miles per hour, using the following generally accepted formula:

$$t = \frac{D}{1.466 \times S}$$

Where *D* is the distance, 434 feet; *1.466* is a mathematical constant; and *S* is the speed limit 55 miles per hour:

$$\begin{aligned} t &= \frac{434}{1.466 \times 55} \\ &= \frac{434}{80.63} \\ &= 5.38261 \\ &= 5.3\,\text{sec} \end{aligned}$$

[redacted]

BOSCH

CDR CRASH DATA RETRIEVAL SYSTEM

CDR File Information

User Entered VIN	[redacted]
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	SMITHVILLE F350.CDR
Saved on	Thursday, March 5 2009 at 12:03:48 PM
Collected with CDR version	Crash Data Retrieval Tool 3.1.1
Reported with CDR version	Crash Data Retrieval Tool 3.1.1
EDR Device Type	airbag control module
Event(s) recovered	Deployment

IMPORTANT NOTICE: Robert Bosch LLC recommends that the latest production release of Crash Data Retrieval software be utilized when viewing, printing or exporting any retrieved data from within the CDR program. This ensures that the retrieved data has been translated using the most recent information including but not limited to that which was provided by the manufacturers of the vehicles supported in this product.

Module Information

The retrieval of this data has been authorized by the vehicle's owner, or other legal authority such as a subpoena or search warrant, as indicated by the CDR tool user on Thursday, March 5 2009 at 12:03:48 PM .

Important Limitations on Vetronix Crash Data Retrieval (CDR) Tool Capabilities.

Disclaimer: This Restraint Control Module (RCM) records longitudinal deceleration data for the purpose of understanding the input data the Restraint Control Module used to determine whether or not to deploy restraint devices. This module does not record vehicle speed, throttle position, brake on-off, and other data, which may be recorded in some 1999 model year and later General Motors modules. The deceleration data recorded by Ford's module during a crash can subsequently be mathematically integrated into a longitudinal Delta-V. Delta-V is the change in velocity during the recording time and is NOT the speed the vehicle was traveling before the accident, and is also not the Barrier Equivalent Velocity. The Vetronix CDR Tool will read and interpret both acceleration in G's and Delta-V in mph. RCM's in Ford vehicles that can be read by the Vetronix CDR tool are listed in the Vetronix Help Files.

Important

If there is any question that the restraint system did not perform as it was designed to perform, please read the system only through the diagnostic link connector. The Vetronix CDR kit provides an RCM interface cable to plug directly into the restraint control module. The Vetronix CDR RCM Interface Cable connects only power, ground, and memory read pins to the relevant vehicle restraint control module. The other RCM pins normally connect to inputs, such as sensors, and outputs, such as airbags, are not connected when you use the RCM Interface Cable to plug directly into the module. Since the vehicle restraint control module is constantly monitoring airbag system readiness (when powered), it will detect that the sensors and airbags are not connected. The restraint control module may record a new diagnostic trouble code into memory for each device that is not connected. These new diagnostic trouble codes may record over previously written diagnostic trouble codes present prior to the accident and spoil evidence necessary to determine if the restraint system performed in the accident as it was designed to perform. Not only could this prevent Ford from being able to determine if the system performed as it was designed to perform, but, regardless of innocent inadvertence, you could raise issues of evidence spoliation in any litigation that may arise out of the accident. If you cannot read the module via the diagnostic link connector, and if you suspect improper system performance, contact Ford Motor Company and request their assistance to read the module with a proper vehicle simulator attached.

While data stored in RCM's is accurate, accident reconstructionists must be aware of the limitations of the data recorded in Ford's control modules and should compare the recorded data with the physical evidence at the accident scene using professional accident reconstruction techniques (i.e. vehicle crush characteristics, skid marks, etc) before making any assumptions about the import and validity of the data recorded in the module with respect to the crash event being analyzed. The following describes specific limitations that must be considered when analyzing recorded data. Investigators should obtain permission of the vehicle owner or have sufficient legal authority prior to reading any data.

1. There may be no deceleration data recorded in the module.
Loss of power (cut wires, damaged battery, crushed fuse box) to the module during or immediately after the crash may prevent the crash data from being recorded. A backup power supply within the module has sufficient power to continue to analyze the deceleration data and deploy restraint devices if needed, but there is no backup power for recording.

If the deceleration input does not create a vehicle longitudinal Delta-V above 4 mph within 100 milliseconds, there may not be any data recorded.

2. In unusual circumstances, deceleration data stored in the module may be from a crash other than the one you are currently analyzing

[redacted]

The module will record data from some non-deploy events. If, after the module has recorded data from a non-deploy event, and there is a subsequent event in which there is a loss of power and no new recording is made for that subsequent event, the deceleration data in the module's memory may be from the prior event. If the new, subsequent event is a deploy event and recording has occurred, the deployment times should be recorded. If there are no deployment times recorded, but airbags or other restraint devices are observed to have deployed, the recorded data that you read are most likely from a prior event.

Once an airbag or other restraint device has been commanded to deploy, the data recorded in connection with that deployment are "locked", and subsequent crashes cannot be recorded.

If a vehicle is being repaired, the RCM should be replaced after any crash in which restraint devices deploy. Early printed shop manuals refer to re-using modules by clearing the "crash data memory full" code, but this is no longer true and the latest on-line electronic shop manual directs that modules be replaced.

Crashes that involve multiple impacts will record only one of the impacts. If there is a deployment, the deployment event will be recorded and locked. If no restraint device is commanded to deploy, the recorded data are not "locked", and subsequent impacts may record over any previous recorded data. Further analysis will be required to determine which of the events was actually recorded.

3. The computed longitudinal Delta-V may understate the total Delta-V

Many real-world crashes can last longer than the memory has the capacity to record. Therefore, the actual Delta-V of the event may be higher than the Delta-V calculated and displayed by the Vetronix CDR System output. Review the end of the longitudinal acceleration/deceleration pulse - if it has not settled to zero G's by the end of the recording, the vehicle longitudinal Delta-V is most likely understated. If there is a clear decaying trend line you may choose, at your own risk, to estimate the total Delta-V by extrapolating the decay trend to zero and to calculate the additional Delta-V not captured.

Under some circumstances where power is interrupted, during the recording of data, or the module re-sets during the recording of data, a partial recording may occur. This will be shown as "no data" in the data table and will not be plotted on the graph of acceleration. When some portion of the acceleration data is not recorded, the Delta-V during that time cannot be calculated. A Delta-V will be calculated for the points that are valid, but the user must be aware that the partial Delta-V calculated will further underestimate the actual event total Delta-V.

4. This module records only longitudinal acceleration/deceleration of the vehicle. You must compute lateral or resultant total acceleration based on your estimated Principal Direction of Force (PDOF).

5. Vertical acceleration/decelerations are not recorded. Vehicle spin about a point not centered on the Restraints Control Module sensor may add or subtract from bulk vehicle motion.

6. This module is not intended to record acceleration/deceleration in a side-impact event. If the side impact generates a longitudinal deceleration component sufficient to wake up the frontal deployment algorithm, there may be a recording of longitudinal deceleration in a side impact event.

Any Longitudinal Delta-V determined by using data read from the air bag module should be verified with physical evidence from the crash (such as vehicle crush, skid marks) and assumed accident sequence. Multiple impacts, angular collisions, side impacts, vehicle spin, etc should be considered in addition to the data read from the air bag module.

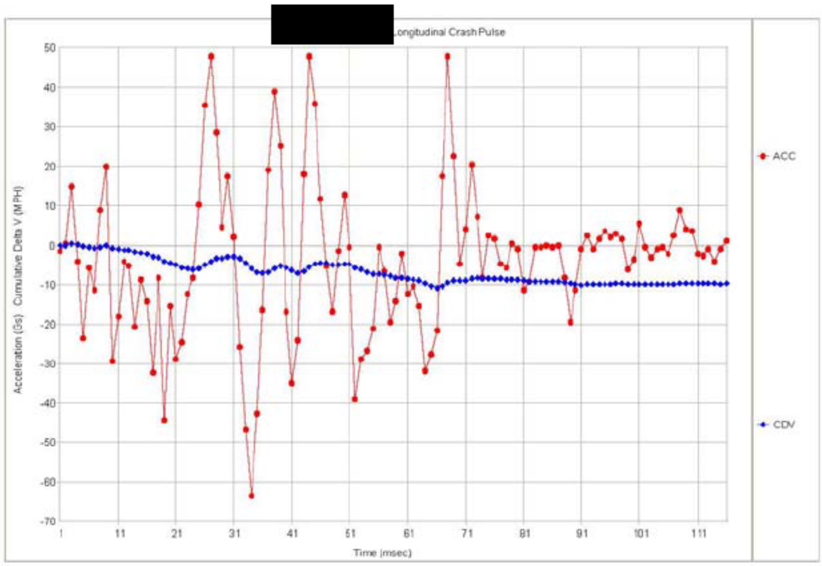
[redacted]

BOSCH CDR CRASH DATA RETRIEVAL SYSTEM

System Status At Deployment

Diagnostic codes active when event occurred	0
Passenger Airbag Switch Position During Event	Activated
Time From Side Safing Decision to Left (Driver) Side Bag Deployment (msec)	Not Deployed
Frontal and Pretensioner Fire time (ms)	18.25

BOSCH CDR CRASH DATA RETRIEVAL SYSTEM



BOSCH CDR CRASH DATA RETRIEVAL SYSTEM

Crash Pulse Data

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
1	-1.54	-0.03
2	0.51	-0.02
3	14.91	0.30
4	-4.11	0.21
5	-23.64	-0.30
6	-5.65	-0.43
7	-11.31	-0.68
8	8.74	-0.49
9	20.05	-0.05
10	-29.30	-0.69
11	-17.99	-1.08
12	-4.11	-1.17
13	-5.14	-1.29
14	-20.56	-1.74
15	-8.74	-1.93
16	-14.39	-2.25
17	-32.38	-2.96
18	-8.22	-3.14
19	-44.20	-4.11
20	-15.42	-4.45
21	-28.78	-5.08
22	-24.67	-5.62
23	-12.34	-5.89
24	-8.22	-6.07
25	10.28	-5.85
26	35.47	-5.07
27	47.80	-4.02
28	28.78	-3.39
29	4.63	-3.28
30	17.48	-2.90
31	2.06	-2.86
32	-25.70	-3.42
33	-46.77	-4.45
34	-63.74	-5.85
35	-42.66	-6.78
36	-16.45	-7.14
37	19.02	-6.73
38	39.06	-5.87
39	25.19	-5.32
40	-16.96	-5.69
41	-34.95	-6.45
42	-24.16	-6.99
43	17.99	-6.59
44	47.80	-5.54
45	35.98	-4.75
46	11.82	-4.49
47	-5.14	-4.60
48	-16.96	-4.98
49	-1.54	-5.01
50	12.85	-4.73
51	-0.51	-4.74
52	-39.06	-5.60

[redacted]

BOSCH

CDR CRASH DATA RETRIEVAL SYSTEM

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
53	-28.78	-6.23
54	-26.73	-6.82
55	-21.07	-7.28
56	-0.51	-7.29
57	-6.68	-7.44
58	-19.53	-7.87
59	-14.39	-8.18
60	-2.06	-8.23
61	-12.34	-8.50
62	-10.28	-8.72
63	-15.42	-9.06
64	-31.87	-9.76
65	-27.76	-10.37
66	-21.59	-10.84
67	17.48	-10.46
68	47.80	-9.41
69	22.62	-8.92
70	-4.63	-9.02
71	4.11	-8.93
72	20.56	-8.47
73	7.20	-8.32
74	-8.22	-8.50
75	2.57	-8.44
76	1.54	-8.41
77	-4.63	-8.51
78	-5.65	-8.63
79	0.51	-8.62
80	-1.03	-8.64
81	-11.31	-8.89
82	-9.25	-9.10
83	-0.51	-9.11
84	-0.51	-9.12
85	0.00	-9.12
86	-0.51	-9.13
87	0.00	-9.13
88	-8.22	-9.31
89	-19.53	-9.74
90	-11.31	-9.99
91	-1.03	-10.01
92	2.57	-9.95
93	-1.03	-9.98
94	1.54	-9.94
95	3.60	-9.86
96	2.06	-9.82
97	3.08	-9.75
98	1.54	-9.72
99	-6.17	-9.85
100	-3.60	-9.93
101	5.65	-9.81
102	-0.51	-9.82
103	-3.08	-9.89
104	-1.03	-9.91
105	-0.51	-9.92
106	-2.06	-9.96
107	2.57	-9.91

[redacted]

Milliseconds	Long. Acceleration (Gs)	Long. Cumulative Delta V (MPH)
108	8.74	-9.72
109	4.11	-9.63
110	3.60	-9.55
111	-2.06	-9.59
112	-2.57	-9.65
113	-1.03	-9.67
114	-4.11	-9.76
115	-1.03	-9.78
116	1.03	-9.76

[redacted]

Hexadecimal Data

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR system.

0800:	A6	42	40	5F	14	A2	58	2D	0D	23	0F	2D	38	4C	C8	FF
0810:	10	FF	ED	13	3C	78	F1	9E	08	A2	F9	EF	19	99	52	49
0820:	2D	03	B3	43	1E	0A	F5	0A	A1	5E	03	0E	1D	1E	00	25
0830:	3C	3C	80	28	05	28	B4	07	28	18	20	0C	03	84	B7	09
0840:	04	05	0B	05	AD	42	0A	06	5E	00	64	00	B4	0B	B8	03
0850:	E8	09	60	11	30	05	78	09	60	01	4A	00	C2	00	C9	0B
0860:	B8	11	94	03	20	00	08	00	0F	00	12	02	8A	05	78	75
0870:	30	00	32	00	C8	01	B7	07	D0	03	20	00	C8	04	45	01
0880:	DC	00	2A	00	C8	00	DC	04	51	32	1E	40	40	01	FA	3C
0890:	32	2D	14	0A	82	17	55	C8	32	1E	02	18	31	03	FF	52
08A0:	14	FF	50	41	60	CC	43	FF	FF	FF	FF	FF	FF	FF	FF	0B
08B0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
08C0:	04	FF	FF	FF	FF	FF	57	09	63	31	43	33	41	02	03	00
08D0:	09	FE	80	00	FE	7B	32	FF	80	03	FF	80	04	FF	80	FF
08E0:	02	FF	80	2F	FF	80	21	FF	80	23	FF	80	0A	FF	80	FF
08F0:	1D	0F	00	00	0A	80	04	FF	FF	FF	FF	FF	FF	FF	00	00
0900:	06	31	42	52	03	75	FF	FF	FF	02	09	AA	AA	FF	FF	AA
0910:	AA	90	08	76	25	FF	FF	04	60	44	48	95	52	67	FF	02
0920:	9A	9E	BA	95	6F	92	87	AE	C4	64	7A	95	93	75	8C	81
0930:	5E	8D	47	7F	65	6D	85	8D	B1	E2	FA	D5	A6	BF	A1	6B
0940:	42	21	4A	7D	C2	E9	CE	7C	59	6E	C0	FA	E3	B4	93	7C
0950:	9A	B6	9C	51	65	69	74	9C	90	77	81	99	85	89	7F	5F
0960:	67	73	BF	FA	C9	94	A5	C5	AB	8D	A2	A0	94	92	9E	9B
0970:	87	8B	9C	9C	9D	9C	9D	8D	77	87	9B	A2	9B	A0	A4	A1
0980:	A3	A0	91	96	A8	9C	97	9B	9C	99	A2	AE	A5	A4	99	98
0990:	9B	95	9B	9F	9D	F1	00	00	FC	9E	00	49	00	00	00	00
09A0:	00	C4	00	60	00	4D	00	1F	00	46	00	57	00	00	00	16
09B0:	00	4D	00	00	00	49	00	C8	01	D2	00	00	00	00	00	00
09C0:	00	00	49	FF	01	FF	FF	07	AF	00	FF	FF	FF	FF	FF	FF
09D0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
09E0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
09F0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

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BOSCH

CDR CRASH DATA RETRIEVAL SYSTEM

Comments

10-50 j4

Disclaimer of Liability

The users of the CDR product and reviewers of the CDR reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Robert Bosch LLC and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Robert Bosch LLC expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the CDR data, CDR software or use thereof.

[redacted]

EXPERT AUTOSTATS
Ver. 4.8w

SGT MIKEL COOL
MISSOURI STATE HIGHWAY PATROL - CRASH TEAM 1
1700 LIPPER AVENUE
HIG[redacted]7-1339

1990 LINCOLN MARK VII 2DR COUPE

CURB WEIGHT:	3615 lbs.	1640 kg.
Curb Weight Distribution -	Front: 56 %	Rear: 44 %
Gross Vehicle Weight Rating:	_______ lbs.	_______ kg.
Number of Tires on Vehicle:	4	
Drive Wheels:	REAR	

HORIZONTAL DIMENSIONS

	Inches	Feet	Meters
Total Length	203	16.92	5.16
Wheelbase:	109	9.08	2.77
Front Bumper to Front Axle	45	3.75	1.14
Front Bumper to Front of Front Well	22	1.83	0.56
Front Bumper to Front of Hood	4	0.33	0.10
Front Bumper to Base of Windshield	60	5.00	1.52
Front Bumper to Top of Windshield	84	7.00	2.13
Rear Bumper to Rear Axle	49	4.08	1.24
Rear Bumper to Rear of Rear Well	32	2.67	0.81
Rear Bumper to Rear of Trunk	3	0.25	0.08
Rear Bumper to Base of Rear Window	30	2.50	0.76

WIDTH DIMENSIONS

Maximum Width	71	5.92	1.80
Front Track	59	4.92	1.50
Rear Track	60	5.00	1.52

VERTICAL DIMENSIONS

	Inches	Feet	Meters
Height	54	4.50	1.37
Ground to:			
Front Bumper (Top)	20	1.67	0.51
Headlight - center	25	2.08	0.63
Hood - top front	31	2.58	0.79
Base of windshield	38	3.17	0.97
Rear Bumper - top	23	1.92	0.58
Trunk - top rear	37	3.08	0.94
Base of rear window	40	3.33	1.02

[redacted]

[redacted]

1990 LINCOLN MARK VII 2DR COUPE

INTERIOR DIMENSIONS

	Inches	Feet	Meters
Front Seat Shoulder Width	56	4.67	1.42
Front Seat to Headliner	38	3.17	0.97
Front Leg - seatback to floor (max)	42	3.50	1.07
Rear Seat Shoulder Width	58	4.83	1.47
Rear Seat to Headliner	37	3.08	0.94
Rear Leg - seatback to floor (min)	37	3.08	0.94

Seatbelts: 3pt LAP & SHOULDER - front, None or Unknown - rear
Airbags: NO AIRBAGS

STEERING DATA

		Inches	Feet	Meters
Turning Circle (Diameter)		516	43.00	13.11
Steering Ratio:	14.70:1			
Wheel Radius:		12	1.00	0.30
Tire Size (OEM):	215-70 R15			

ACCELERATION & BRAKING INFORMATION

Brake Type: ALL DISC
ABS System: ABS

Braking, 60 mph -> 0 (Hard pedal, no skid, dry pavement):
d = 138 ft t = 3.1 sec. a =-28.0 ft/sec/sec G-force = -0.87

ACCELERATION:

0->30 mph	t = __._ sec.	a = __._ ft/sec/sec	G-force = _.__
0->60 mph	t = 13.0 sec.	a = 6.8 ft/sec/sec	G-force = 0.21
45->65 mph	t = __._ sec.	a = __._ ft/sec/sec	G-force = _.__

Transmission Type: AUTOMATIC

NOTES:

Federal Bumper Standard Requirements = 2.5 MPH
This vehicles Rated Bumper Strength: 5 mph

N.S.D.C. = 1984 - 1991

[redacted]

[redacted]

1990 LINCOLN MARK VII 2DR COUPE

OTHER INFORMATION

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   TIP-OVER STABILITY RATIO   =   1.35   STABLE
   NHTSA Star Rating (calculated)         ****

CENTER OF GRAVITY (No Load):
     Inches behind front axle     =  47.96
     Inches in front of rear axle =  61.04
     Inches from side of vehicle  =  35.50
     Inches from ground           =  22.06
     Inches from front corner     =  99.51
     Inches from rear corner      = 115.62
     Inches from front bumper     =  92.96
     Inches from rear bumper      = 110.04

MOMENTS OF INERTIA APPROXIMATIONS (No Load):
     YAW MOMENT OF INERTIA                        =  2517.45  lb-ft-sec^2
     PITCH MOMENT OF INERTIA                      =  2429.85  lb-ft-sec^2
     ROLL MOMENT OF INERTIA                       =   500.70  lb-ft-sec^2

FRONT PROFILE INFORMATION
     ANGLE FRONT BUMPER TO HOOD FRONT                 =  70.0   deg
     ANGLE FRONT OF HOOD TO WINDSHIELD BASE           =   7.1   deg
     ANGLE FRONT OF HOOD TO WINDSHIELD TOP            =  14.7   deg
     ANGLE OF WINDSHIELD                              =  30.3   deg
     ANGLE OF STEERING TIRES AT MAX TURN              =  24.2   deg
```

FIRST APPROXIMATION CRUSH FACTORS:

Speed Equivalent (mph) of Kinetic Energy (KE) used in causing crush or indentation may be evaluated using the following formula, the appropriate Crush Factor (CF), and Maximum Indentation Depth (MID), in feet:

V(mph) = Sqr root of (30 * CF * MID)

KE Equivalent Speed (Front/Rear/Side) = 21 CF

Bullet vehicle IMPACT SPEED estimation based on TARGET VEHICLE damage ONLY = 27 CF (Tested for Rear/Side Impact only)

These CF values are based upon analysis of NHTSA Barrier Crash data, and from over 1000 vehicle accidents where independant evaluation of speed was possible. (These are NOT 'A', 'B', 'C', or 'G' values)

The Rear Impact data with more than 2-3 inches of crush damage should be looked at carefully, since some vehicles have very weak trunk & fender strength. Therefore, on some cars, esp. GM, your estimate from the rear crush data may be high by as much as 4-5 mph (on a crush of 18 inches).

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[redacted]

EXPERT AUTOSTATS
Ver. 4.8w

SGT MIKEL COOL
MISSOURI STATE HIGHWAY PATROL - CRASH TEAM 1
1700 LIPPER AVENUE
HIGGINSVILLE MO 64037-1339

[redacted]

2003 FORD F350 SUPER DUTY CREW CAB LWB 4DR 4X4 PICKUP

CURB WEIGHT:	6339 lbs.	2875 kg.
Curb Weight Distribution -	Front: 60 %	Rear: 40 %
Gross Vehicle Weight Rating:	9900 lbs.	4491 kg.
Number of Tires on Vehicle:	4	
Drive Wheels:	4 Wheel Drive	

HORIZONTAL DIMENSIONS

	Inches	Feet	Meters
Total Length	262	21.83	6.65
Wheelbase:	172	14.33	4.37
Front Bumper to Front Axle	39	3.25	0.99
Front Bumper to Front of Front Well	15	1.25	0.38
Front Bumper to Front of Hood	5	0.42	0.13
Front Bumper to Base of Windshield	51	4.25	1.30
Front Bumper to Top of Windshield	78	6.50	1.98
Rear Bumper to Rear Axle	51	4.25	1.30
Rear Bumper to Rear of Rear Well	30	2.50	0.76
Rear Bumper to Rear of Trunk	5	0.42	0.13
Rear Bumper to Base of Rear Window	104	8.67	2.64

WIDTH DIMENSIONS

	Inches	Feet	Meters
Maximum Width	80	6.67	2.03
Front Track	66	5.50	1.68
Rear Track	66	5.50	1.68

VERTICAL DIMENSIONS

	Inches	Feet	Meters
Height	81	6.75	2.06
Ground to:			
Front Bumper (Top)	34	2.83	0.86
Headlight - center	41	3.42	1.04
Hood - top front	49	4.08	1.24
Base of windshield	58	4.83	1.47
Rear Bumper - top	35	2.92	0.89
Trunk - top rear	60	5.00	1.52
Base of rear window	60	5.00	1.52

[redacted]

[redacted]

2003 FORD F350 SUPER DUTY CREW CAB LWB 4DR 4X4 PICKUP

INTERIOR DIMENSIONS

	Inches	Feet	Meters
Front Seat Shoulder Width	64	5.33	1.63
Front Seat to Headliner	41	3.42	1.04
Front Leg - seatback to floor (max)	41	3.42	1.04
Rear Seat Shoulder Width	65	5.42	1.65
Rear Seat to Headliner	38	3.17	0.97
Rear Leg - seatback to floor (min)	32	2.67	0.81

Seatbelts: 3pt - front and rear
Airbags: FRONT SEAT AIRBAGS

STEERING DATA

		Inches	Feet	Meters
Turning Circle (Diameter)		732	61.00	18.59
Steering Ratio:	17.00:1			
Wheel Radius:		___	__.__	_.__
Tire Size (OEM):	LT235/85R16			

ACCELERATION & BRAKING INFORMATION

Brake Type: ALL DISC
ABS System: REAR ABS STANDARD, ALL WHEEL ABS OPTIONAL

Braking, 60 mph -> 0 (Hard pedal, no skid, dry pavement):
d = ___ ft t = __._ sec. a =-__._ ft/sec/sec G-force = -_.__

ACCELERATION:

0->30 mph	t = __._ sec.	a = __._ ft/sec/sec	G-force = _.__
0->60 mph	t = __._ sec.	a = __._ ft/sec/sec	G-force = _.__
45->65 mph	t = __._ sec.	a = __._ ft/sec/sec	G-force = _.__

Transmission Type: 5spd MANUAL

NOTES:

Federal Bumper Standard Requirements = NO REQUIREMENT

N.S.D.C. = 2000 - 2004

[redacted]

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2003 FORD F350 SUPER DUTY CREW CAB LWB 4DR 4X4 PICKUP

OTHER INFORMATION

TIP-OVER STABILITY RATIO = 1.06 REASONABLY STABLE
NHTSA Star Rating (calculated) **

CENTER OF GRAVITY (No Load):

Inches behind front axle	=	68.80
Inches in front of rear axle	=	103.20
Inches from side of vehicle	=	40.00
Inches from ground	=	31.14
Inches from front corner	=	114.98
Inches from rear corner	=	159.30
Inches from front bumper	=	107.80
Inches from rear bumper	=	154.20

MOMENTS OF INERTIA APPROXIMATIONS (No Load):

YAW MOMENT OF INERTIA	=	5186.17	lb-ft-sec^2
PITCH MOMENT OF INERTIA	=	5442.68	lb-ft-sec^2
ROLL MOMENT OF INERTIA	=	1159.58	lb-ft-sec^2

FRONT PROFILE INFORMATION

ANGLE FRONT BUMPER TO HOOD FRONT	=	71.6	deg
ANGLE FRONT OF HOOD TO WINDSHIELD BASE	=	11.1	deg
ANGLE FRONT OF HOOD TO WINDSHIELD TOP	=	22.3	deg
ANGLE OF WINDSHIELD	=	37.9	deg
ANGLE OF STEERING TIRES AT MAX TURN	=	26.9	deg

FIRST APPROXIMATION CRUSH FACTORS:

Speed Equivalent (mph) of Kinetic Energy (KE) used in causing crush or indentation may be evaluated using the following formula, the appropriate Crush Factor (CF), and Maximum Indentation Depth (MID), in feet:

V(mph) = Sqr root of (30 * CF * MID)

KE Equivalent Speed (Front/Rear/Side) = 21 CF

Bullet vehicle IMPACT SPEED estimation
based on TARGET VEHICLE damage ONLY = 27 CF
(Tested for Rear/Side Impact only)

These CF values are based upon analysis of NHTSA Barrier Crash data, and from over 1000 vehicle accidents where independant evaluation of speed was possible. (These are NOT 'A', 'B', 'C', or 'G' values)

The Rear Impact data with more than 2-3 inches of crush damage should be looked at carefully, since some vehicles have very weak trunk & fender strength. Therefore, on some cars, esp. GM, your estimate from the rear crush data may be high by as much as 4-5 mph (on a crush of 18 inches).

[redacted]


WEIGHT LIMIT 50 TONS


WEIGHT
LIMIT
50
TONS


WEIGHT
LIMIT
50
TONS
STATE TROOPER


1200-HP


50
TONS
SAFE&
SOUND

TONS
SAFE &
SOUND


SAFE&
SOUND


CITY LIMIT
SMITHVILLE
SPEED LIMIT 25 EXCEPT WHERE POSTED


45
MPH


45


Ford


MARK VII
LINCOLN


AUTO PARTS
LSC
LINCOLN


LSC


3CS 63R


WARNING
ALARMED
F350
DIESEL V8
RADIAL APR

[redacted]


7508259 X


DIESEL


FX4
OFF ROAD
RADIAL APR
TRAIL MARK


FX4
OFF ROAD
F-350
SUPER DUTY
Bobcat
One Tough Animal
RADIAL APR


WARNING
ALARMED
ECTION
F·350
SUPER DUTY
Ford
Thoroughbred


WARNING
ALARMED
FX4
OFF ROAD
F-350
SUPER DUTY
Ford
Thoroughbred
[redacted]


350
SUPER DUTY
POWER STROK


POWER STROKE
DIESEL


9L02


LSC
LINCOLN

Turn down

No cause

Fatality caused by T-bone collision