U.S. Department of Transportation
National Highway Traffic Safety Administration

ODI RESUME

Investigation: EA07-013
Prompted By: PE07-025
Date Opened: 09/14/2007 Date Closed: 09/12/2008
Principal Investigator: Peter Ong
Subject: Trailer Hitch Receiver Failure

Manufacturer: General Motors Corp.
Products: MY 2002 C/K 2500 Suburban/Yukon/Silverado/Sierra/Avalanche
Population: 215,000

Problem Description: Failure of the factory installed trailer hitch receiver.

FAILURE REPORT SUMMARY

	ODI	Manufacturer	Total
Complaints:	6	35	41
Crashes/Fires:	0	2	2
Injury Incidents:	0	1	1
# Injuries:	0	2	2
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0
Other*:	0	89	89

*Description of other: Warranty claims related to this issue.

Action: Close this investigation.

Engineer: *Peter Ong* PCO Date: *09/12/2008*
Div. Chief: *Thomas Z. Cooper* Date: *09/12/2008*
Office Dir.: *Kathleen C. DeMeter* Date: *09/12/2008*

Summary: Complaint reports allege poor weld quality and/or bending of the subject vehicle original equipment trailer hitch receiver. The agency's investigation included analysis of manufacturer and agency incident reports, review of police reports, analysis of the agency's Fatal Analysis Reporting system, a vehicle owner survey, inspection of tow vehicles/hitches and analysis of failed parts. Incidents of weld failure were rare and associated with very low-speed driving (turning, backing and sudden stopping). Incidents of bending were associated with improper trailer hitch adjustment or overloading.

A safety-related defect has not been identified at this time and further use of agency resources does not appear to be warranted. Accordingly, this investigation is closed. The closing of this investigation does not constitute a finding by NHTSA that a safety-related defect does not exist. The agency will monitor this issue and reserves the right to take further action if warranted by the circumstances.

Background: On September 14, 2007, the Office of Defects Investigation (ODI) opened this Engineering Analysis (EA) based on allegations of hitch receiver failures in certain model year (MY) 2002 GMT800 series full size 2500 C/K sport utility vehicle (SUV) and pickup (PU) vehicles (subject vehicles). Separation of the hitch receiver during high-speed vehicle operation can lead to loss of vehicle/trailer control and occupant injury. GM reports that it produced approximately 215,052 MY2002 SUV/PU subject vehicles equipped with original equipment manufacturer (OEM) hitch receivers typically installed as part of the standard towing package option. Models include the Chevrolet Suburban, Tahoe, Avalanche and Silverado, the Cadillac Escalade, and the GMC Yukon and Sierra vehicles. ODI broadened its data request by collecting information for all types of mechanical hitch issues to understand the problem experienced by the towing public. Reported problems include hitch breakage, weld failures, bent hitch receiver and improper hitch installation. In addition, during the Preliminary Evaluation (PE07-025[1]) investigation, ODI also collected information on other 1500 and 2500 GMT800 series vehicles from MY1999 through MY2006 (GM non-subject vehicles) and other manufacturers' full size SUV and PU vehicles (peer vehicles) for comparison and analysis. This EA[2] investigation is a continuation of that analysis of hitch failures.

Hitch Receiver Assembly: The OEM hitch receiver as shown in Figure 1 consists of welded steel tube and plates. The assembly is attached to the frame rail at the rear of the vehicle. The 2½ inch receiver box assembly allows for the insertion of the tow bar/ball mount and tow trailer (with addition of weight distribution system attached). To the left of the receiver box assembly is the electrical connector for powering the trailer's electrical lights and brake system. Figure 2 shows the detail of the hitch receiver assembly detached from the vehicle. As shown, the receiver box is attached to the cross tube via welds at the slant steel plate interfaces and at the "U" shaped bracket (upside down "hat"). There are holes/slots in the slant steel plate (chain plate) of the receiver box assembly for the attachment of the trailer safety chains and the trailer emergency brake activation cable. The unit attaches to the bottom of the vehicle frame by mechanical fasteners (bolts) at both mounting brackets and with fasteners to the bumper at the top of the "U" shaped bracket.

Hitch Receiver Design and Quality Control: The design of the hitch receiver has remained the same throughout the 1500/2500 GMT800 series production period (MY1999-MY2006). Production Stamping (MI) was the initial supplier from 1999 through 2003. Cooperweld (Ontario, Canada) made the units from 2003 through 2005. Currently, Northern Stamping of Cleveland, OH is supplying the hitch receivers and they are the supplier for the latest generation of GMT 900 series vehicles. Over the years, GM and its suppliers made some quality and process improvements. In January 2002, Production Stamping strengthened its destructive and non-destructive inspection processes and in July 2007, Northern Stamping added sensors to ensure the parts were in position and aligned prior to the welding phase.

[1] Resumes, Information Request letters, and manufacturer responses can be found in the public file for PE07-025. http://www-odi.nhtsa.dot.gov/defects/defectsearch.cfm

[2] Resumes, Information Request letters, and manufacturer responses can be found in the public file for EA07-013. http://www-odi.nhtsa.dot.gov/defects/defectsearch.cfm

Hitch Failures During High Speed Operation: Hitch receiver separation during high-speed transit can lead to loss of vehicle control and/or personal injury. There were two types of high-speed hitch receiver box failures of concern during this investigation. Hitch receiver box tear/breakage from trailer sway/extreme side loading and hitch receiver box weld failure due to an inadequate weld construction. Normally, when the vehicle operator senses a trailer sway, the operator can mitigate the effects by energizing the electric trailer brakes to stabilize the trailer and/or slowing down the vehicle. A combination of a strong crosswind, high-speed tractor drive by, and/or an imbalanced trailer setup can cause trailer sway. If the trailer sway is sufficiently severe or the operator is unable to mitigate the sway condition, catastrophic failure leading to crash and/or injury can occur. As the tow vehicle and trailer violently sways or the trailer begins to tip over on its side or "jackknife," the loading at the hitch receiver box/connection can be sufficiently high to cause structural failure leading to breakage/tear of the receiver box assembly from the welded hitch cross tube and "U" bracket. In addition, in the GM hitch design, when the receiver box assembly breaks away from the hitch receiver, the chain plate containing the safety chain and emergency brake activation anchorages may also tear off with the receiver box assembly. Telltale signs for this overload failure condition include initial trailer sway as noticed by the operator, extreme lateral and twisting loads (from trailer tipping) in the failed part, and the part's tear/break line to be at the material and not at the weld interface.

If the hitch receiver box failure was due to an inadequate weld construction, the telltale signs for this quality failure condition would be very different. They would include initial separation of the trailer that may or may not activate the safety chain and emergency trailer brakes, longitudinal loads with little lateral or twisting loads in the failed part, and the part's tear/break line to be at the weld interface (due to poor quality welds that is weaker than the parent material).

Hitch Failures During Low Speed Operation or Observed During Static Inspection: Hitch receiver separation and/or damage during low-speed maneuvers, backing up of the trailer or sudden stops at intersections and crossings generally do not lead to any loss of vehicle control and/or personal injury. In addition, bent receiver box assembly due to improper setup and other minor hitch issues like surface rust, hitch noise and rattling due to loose parts are also unlikely to produce a significant safety hazard and they are readily observable during routine static inspection and walkthrough by the operator.

Subject Vehicle Owner Complaints and Warranty Claims: As of April 2008, ODI identified 41 owner complaints and 89 warranty claims totaling 130 reports for all issues associated with the hitch receiver. The rate, combining complaints and warranty claims is 0.06% of a subject vehicle population of 215,052 vehicles. Among the 41 complaints, ODI is aware of one high-speed crash incident leading to two minor injuries and one other low-speed maneuver incident resulting in one vehicle damaged. None of the 130 warranty claims reported any resulting hazards like property damage, loss of vehicle control or personal injury.

The one high-speed hitch separation incident did not involve any other vehicle and occurred during May 2003 in Yakima, WA. The 2002 GMC Sierra pickup truck towing a large 36-foot Keystone travel trailer at highway speed when it encounter strong crosswinds leading to trailer sway. The trailer fishtailed and separated from the vehicle. The trailer collided with the towing

vehicle and eventually ended on its side. The report alleges weld integrity issue; but no additional information was available to validate the claim. The occupants sustained minor soft tissue injuries (bruises and stains) to the lumbar and thoracic regions.

The remaining 40 complaints include seven hitch separations occurring during low-speed maneuvers, 22 bent hitch incidents found during routine operator inspection and 11 other incidents that were unclear due to lack of available information. None of these 40 complainants reported any loss of vehicle control or personal injury; however, ODI was able to determine that three of the low-speed maneuver incidents were due to weld failure at the hitch receiver box. The first of these incidents occurred in July 2004, and involved a 2002 Silverado truck towing a large 29-foot Fleetwood Prowler travel trailer and was preparing to make a low-speed turn out of a fuel service station parking lot. According to the owner, the travel trailer separated and rolled backwards and lightly struck another vehicle. There was no police accident report (PAR) or expert's report, but photographic evidence did indicate that the failure occurred at the receiver box assembly's weld region. The owner repaired the hitch by re-welding the receiver box onto the crossbar section and reported no further problems with the hitch receiver. The second weld related incident occurred in May 2005 when the owner of a 2002 Sierra truck was preparing to make a turn at the intersection but instead initiated a sudden stop when the oncoming vehicle failed to stop at for a red light. According to the owner, the trailer "jammed" into back of tow vehicle resulting in the hitch failing at the weld interface. The third weld incident occurred in January 2002 shortly after the owner purchased the vehicle and within 500 miles of vehicle usage. GM and Production Stamping quality personnel retrieved the part for post failure analysis and determined that two of the welds lacked proper penetration/fusion. Because of this incident, Production Stamping made improvements to their quality control process starting in January 2002 that have resulted in fewer hitch issues from vehicles built in the latter part of MY2002 when compared with vehicles built prior to January 2002.

The 89 warranty claims did not contain sufficient detail for any post failure or causation analysis. According to the claims' trouble code and verbatim description, the most common trouble codes were "Broken-36 reports," "Cracked-31 reports," and "Loose-22 reports" and accounted for 98 percent of all claims. GM did not report any vehicle damage, crashes or injuries from these claims. Little information was available to verify any of these allegations/statements. None of these incidents indicated hazardous conditions.

GM Non-Subject Vehicle Owner Complaints and Warranty Claims: As of April 2008, ODI identified 123 owner complaints and 752 warranty claims totaling 877 reports covering a GM non-subject vehicle population of 6,409,600 units (rate of 0.01%). Among the 123 owner complaints, ODI is aware of nine high-speed hitch separation incidents resulting in four injury incidents (10 injuries and 1 fatal) and 114 other minor low-speed or static incidents leading to 10 vehicle damage incidents with no injury. All four of the injury incidents occurred at highway speed when the trailer experienced sway/fishtail condition, leading to a loss of vehicle/trailer control and eventual separation of the trailer from the tow vehicle. A review of the available PAR, expert's report, photographic documentation and failed parts indicate a parent material overload or tearing failure and not a weld failure from poor quality welds. Two of the injury incidents accounted for eight of the ten injuries with one of those incident having four injuries

and a fatality. In this case, the MY2002 1500 Suburban was travelling westbound on route US-50 highway down a mountain pass (6.5% gradient) while towing a newly acquired 26-foot Nash travel trailer. The tow vehicle/travel trailer began to sway and the driver eventually lost control (travel trailer tipped on its side and separated). The vehicle then struck the safety guardrail, left the roadway, rolled down a 42-foot embankment (roll over), and rested 159 feet from the departed roadway. During the roll over event, one of the middle seat occupants was ejected and died from injuries. The other four-injury crash incident also experienced severe side loading on the hitch leading to an overload failure of the receiver box (as indicated from the crash photographs). The vehicle went off the roadway and rolled over. Two other high-speed overload failures include one injury each and the remaining five high-speed overload incident reports indicate no properly damage or injuries.

The 114 low-speed hitch incidents consist of 10 hitch separations during low-speed maneuvers (turns and backing up), 48 bent hitch receivers from improper trailer loading and 56 other with unclear descriptions of hitch condition due to lack of information. These types of incidents did not result in any vehicle damage, loss of vehicle control or injuries and they are unlikely to represent potential for significant safety risk.

The 752 warranty claims did not contain sufficient detail for any post failure or causation analysis. According to the claims' trouble code and verbatim description, the most common trouble codes were "Loose-375 reports," "Broken-205 reports" and "Cracked-116 reports" and accounted for 93 percent of all claims. These claims did not result in any vehicle damage, loss of vehicle control or personal injuries.

GM Owner Survey: Both GM and NHTSA conducted owner surveys to further understand the concerns experienced by vehicle owners. In July 2007, GM conducted a phone survey of GMT800 series SUV and PU vehicle owners with OEM hitch receivers. GM randomly contacted 103 owners with 48 owners responding to the survey. The type of trailers towed by these owners ranged from small utility trailers to large recreation vehicle (RV) travel trailer at the limits of the vehicle's tow capacity. Eighty percent (80%) of the hitch complaints reported bent hitch receivers and 11% specifically identified welding concerns/issues. GM found that that a high percentage of owners did not know the specific trailer tongue weight or the actual trailer weight of their setup.

ODI Owner Survey: ODI conducted its own phone survey of subject vehicle (SV) and non-subject vehicle (NSV) owners who reported hitch issues in NHTSA's consumer hotline (VOQ) or in GM's owner reports (MOR). The survey focused on owners who reported a broken hitch as opposed to a bent or loose hitch. ODI successfully contacted 29 of these 49 owners to obtain additional details (verbal description, PAR and/or photographic data) related to their incidents. In general, these owners were towing large RV/travel trailers near the towing capacity of the vehicle/hitch receiver. Twenty-seven of the 29 owners towed larger travel trailers weighing in excess of 5,000 pounds and therefore used a weight distribution (WD) hitch system. All six owners who reported a high-speed hitch separation stated that they experienced trailer sway as the initiating event prior to the failed condition. Analysis of the broken parts from these high-speed hitch separations showed overload conditions as the cause of these hitch failures (see

details in the section below). The 23 other owners reported failures during low-speed maneuvers (making tight turns and backing up), sudden stops or during routine static visual inspection of the setup.

VRTC Owner Survey: In late 2007, NHTSA's Vehicle Research and Testing Center (VRTC) also conducted an owner survey of GMT800 series SUV and PU vehicle owners. Almost 2,000 owner surveys were mailed to Ohio vehicle owners with 457 owners responding. From those who responded, 308 owners had an OEM hitch receiver and tow a trailer. Three owners reported hitch "strength/structure" issue, 132 owners reported a rust issue (poor protective finish on the units) and the remaining 173 owners expressed satisfaction with their products. VRTC visited all three of the owners with "strength/structure" issues and a few of the owner with rust issues. VRTC inspected the hitches and arranged to purchase the owners' hitches for further testing and analysis at VRTC. VRTC determined from the inspection of the three "strength/structure" hitches that one was bent downward and the other two were bent upward. The owner of the downward bent hitch towed a utility trailer that can weight over 5,000 pounds but did not use a weight distribution hitch and likely exceeded the trailer tongue weight of 600 lbs as stated on the placard located on the hitch receiver. Both owners with upward bent hitches towed large 12,000 pounds travel trailers and are likely to have improperly adjusted the weight distribution hitch. VTRC's analysis included sectioning of the welds and material analysis of the steel from these three units and some of the rusted units. The results showed proper weld quality and steel material. VRTC found no weld quality issue during its survey, vehicle inspections or parts analyses.

Inspection and Analysis of Hitch Receiver: ODI obtained the hitch receiver or detailed photographic documentation from 16 owners who alleged hitch strength or weld concerns. This included parts from both the subject and non-subject vehicle owners. Upon detailed inspection of the parts, photographs and post material analysis, ODI did not find any catastrophic high-speed receiver separation due to weld failures. Weld cross-section inspections by VRTC indicated proper weld penetration in the metal and material analysis of the parent material indicated proper strength. Analysis from the one part with weld failure did confirm that the weld was inadequate and lacked proper strength. Eight returned parts showed overload failures from severe side loading. The side loads were generated during high-speed trailer sway, low-speed maneuvers or sudden stops. Weld cross section inspection and parent material analysis determined that the welds in these eight failed units were adequately constructed with proper parent material and strength. The welds and parent material of the bent hitch also exhibited proper fusion and strength.

It should be noted that all of the above failure conditions should be detectable during routine inspection by the operator prior to each tow sequence. As evident from the failed parts, prior metal damage or cracks should be detectable by the operator before the final failure/separation of the part. As for inspection and detection of a bent receiver, a side view of the hitch receiver (with vehicle on level grounds) should indicate this condition. Rust and other non-destructive conditions are readily visible and should be rectified by the operator before a serious failure condition can occur.

VRTC Testing of Trailer Hitch Receiver: VRTC performed a series of bench and instrumented dynamic tests to understand the characteristics and limitations of the GMT800 series hitch receiver. Bench tests included hardness tests, tensile tests, fracture analysis, failure modes analysis, overload and fatigue tests. Dynamic tests included driving the trailer over various rough roads and hazards. During the overload test, VRTC applied torque loads at the longitudinal and/or vertical axis of the vehicle until failure. Examination of the tear/break pattern from the failed part was similar to the parts recovered from the real-world hitch separation failures (see Figure 3). This supports the concept of the trailer swaying and tipping on it side and creating severe side and twisting loads resulting in overload condition of the hitch receiver.

VRTC performed vehicle dynamic tests by driving a GMT800 series vehicle and towing a trailer over various road conditions. The types of rough road conditions are summarized in Figure 4. The towed trailer weighs 10,000 pounds and is the upper limit of the GMT800's towing capacity. Two aftermarket WD systems with sway control devices were used to connect the trailer to the tow vehicle (see Figure 5). The installation of the WD spring bars and sway control devices in effect "ties the trailer to the tow vehicle" via the hitch receiver interface. The benefits are improved vehicle handling and trailer sway control. VRTC instrumented the hitch receiver to measure loads during the dynamic tests (see Figure 6). The results showed that the GMT800 hitch receiver withstood normal towing conditions. However, hazards like deep chuckholes or running over curbs can produce high torque loads of 3,000 ft-lbs with peaks of 4,000 ft-lbs. When the peak torque load of 4,000 ft-lbs was applied during follow-on fatigue testing, the hitch receiver failed at only 10,000 cycles. This test showed that extreme road conditions, hazards or mishaps while towing could stress the towing equipment at or near its limits.

FARS Data Search: NHTSA's National Center for Statistics and Analysis (NCSA) performed a FARS (Fatal Analysis Reporting System) database search for any MY2000-2006 GMT800 series vehicles towing a trailer involved in a fatal incident. NCSA identified eleven fatal incidents while towing a trailer in the system (1999 through 2005 crash years) and obtained details (police accident reports) on six of the incidents. Figure 7 shows a summary of the fatal analysis. There was no reported hitch receiver weld related failure incident (causing subsequent crashes/fatality).

Peer Vehicle Owner Complaints and Warranty Claims: As of May 2007,[3] peer manufacturers reported a combined total of 122 owner complaints and warranty claims from 1,885,353 MY2002 and MY2003 peer vehicles (rate of 0.006%). The peer vehicles include the Dodge Ram & Durango, the Ford F150 & Expedition, the Lincoln Navigator & Excursion and the Toyota Tundra & Sequoia vehicles sold with OEM trailer hitch receivers. There were two crash incidents and no injury or fatality reported. Sporadic quality control/assembly issue of loose mounting bolts and noise was the predominant concerns found. However, ODI did not observe any defective trend for these peer vehicles as a whole or from each individual model.

[3] The peer vehicle data request was performed during the PE phase of the investigation and can be found in the public file for PE06-025. http://www-odi.nhtsa.dot.gov/defects/defectsearch.cfm.

Conclusion: The design and manufacturing process associated with the OEM hitch receiver installed in the subject MY2002 2500 C/K vehicles appear to be adequate but without any excess capacity. Incidents of poor quality welds were identified but were rare in frequency and normally discovered early in the life cycle and/or during low-speed maneuvers with no loss of vehicle control or personal injuries. The one documented high-speed hitch separation was determined to be from an overload condition (side loading from trailer sways) and not due to the quality of the part. The other hitch separation incidents occurred during very low-speed turning, sudden stopping or backing up and did not present a risk of loss of control. Improper hitch/trailer setup and overloading of the hitch were the primary causes of the majority of the hitch bending issues and they too did not provide indications of a safety defect trend.

The overall rate of high-speed hitch failures leading to trailer separation was very low and ODI did not observe any high-speed incident trend relating to weld quality control. Safe towing practices can reduce the number of both high-speed and low-speed hitch failures. Owners can obtain additional resources on safe towing practice from the vehicle's owner manual, vehicle manufacturer towing guide, RV industry[4], the towing industry/consumer organization[5] and numerous consumer based organizations[6]. As for determining the actual weight of the towing setup, state highway weight stations[7] and some truck plazas have the weight equipment to measure the tow vehicle and/or trailer. This investigation did not identify any defect trend with the OEM hitch receiver in MY2002 2500 series SUVs and PU vehicles.

[4] Recreation Vehicle Industry Association (RVIA) monitors compliance of the plumbing, heating, fire and life safety, and electrical systems of the RVs. http://www.rvia.org/AM/Template.cfm?Section=About_RVIA

[5] RV Safety & Education Foundation (RVSEF) provides RV safety training and seminars and onsite vehicle weighting seminars. http://www.rvsafety.com/default.html

[6] RV Links for general information and resources. http://www.rv-links.com/safety.htm; Woodall's RV website for general information and RV owner forum/exchange message board. http://www.woodalls.com/.

[7] Trucks and commercial vehicles weight stations are equipped with scales. Nominal fees may apply for each scale reading.. http://www.rvtowingtips.com/how-to-weigh.htm provides information on weighing a RV at the weight station.

Figure 1. Overview of the Hitch Receiver Assembly

Trailer Hitch Receiver Assembly

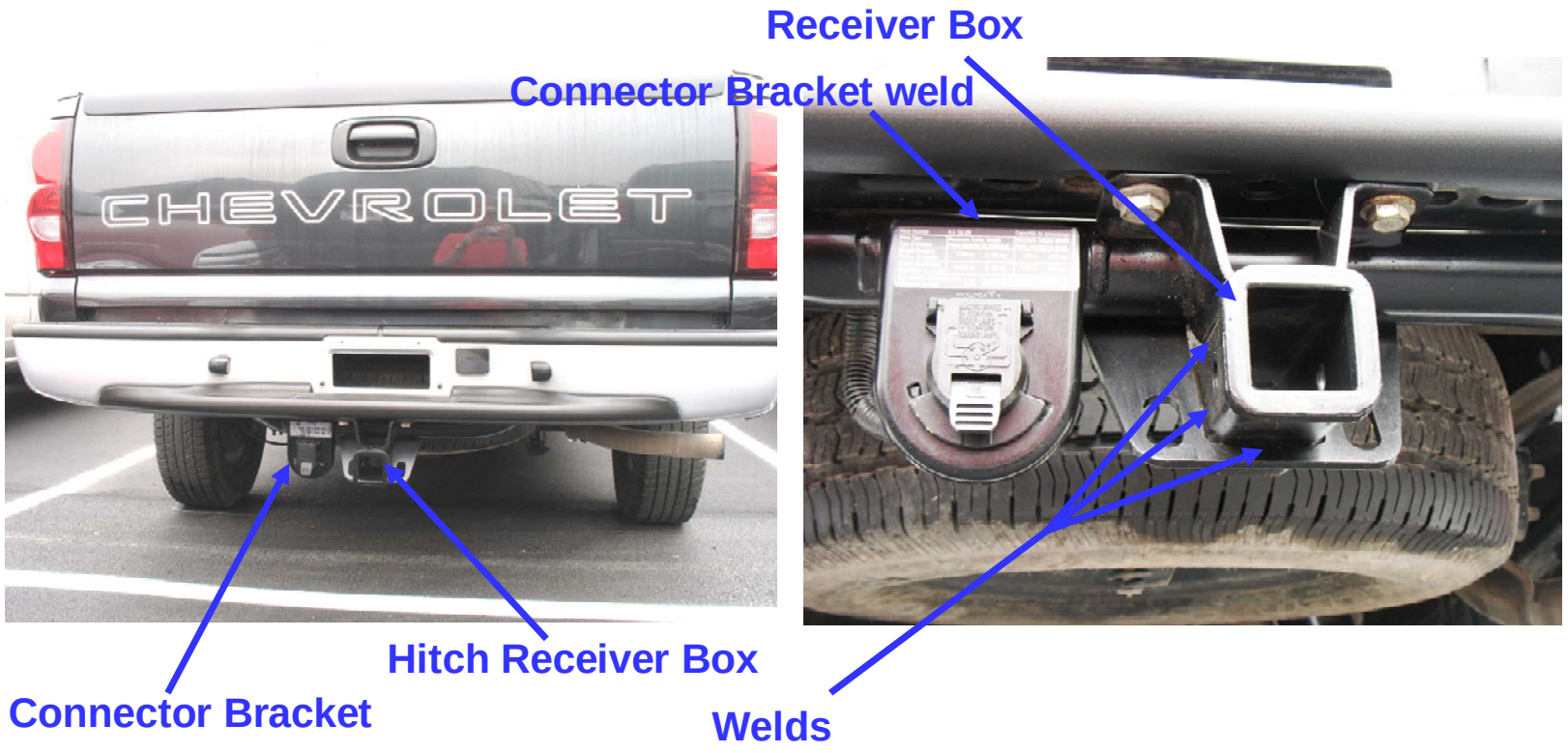


Figure 2. Receiver Assembly - Detail

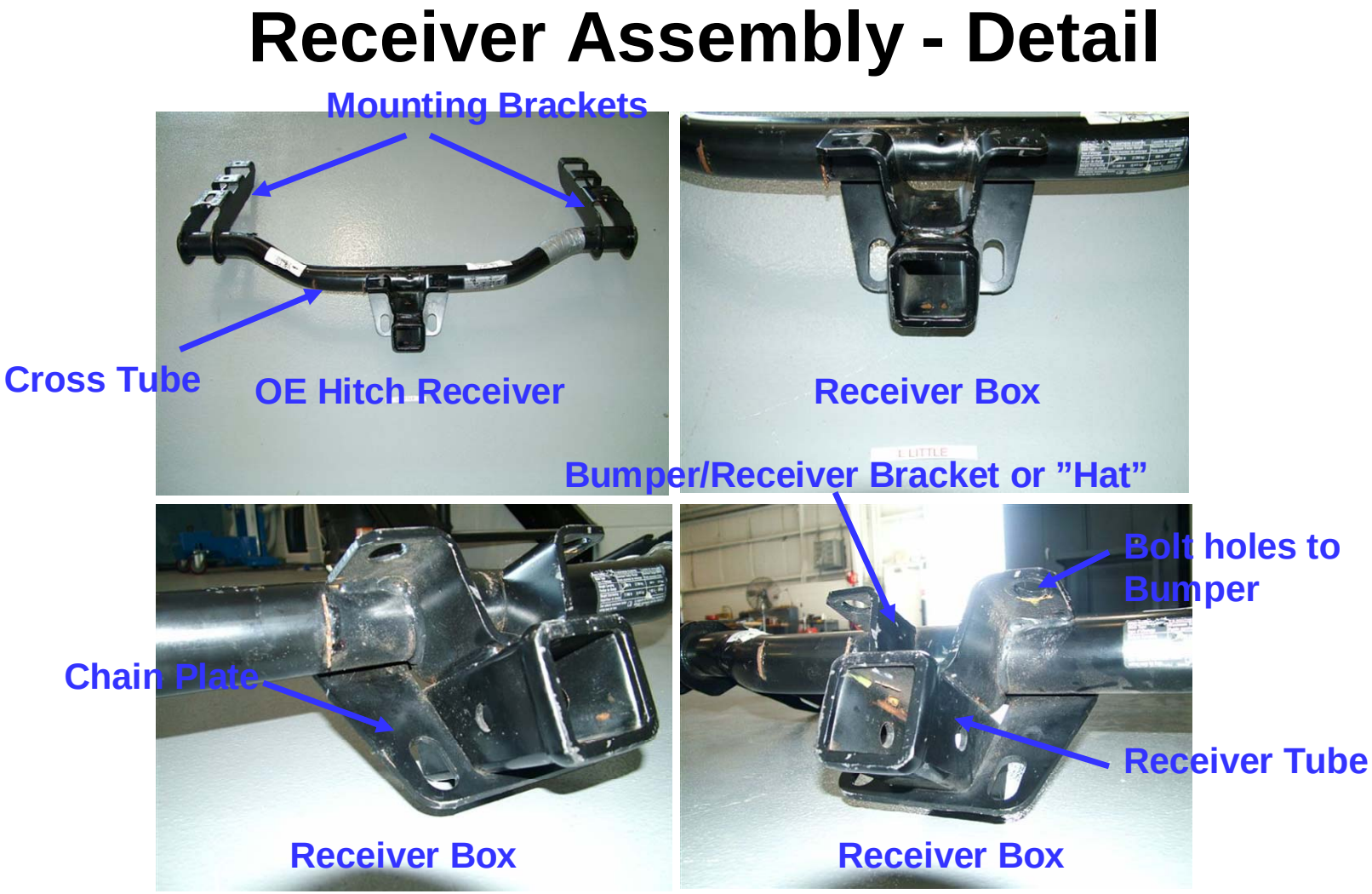


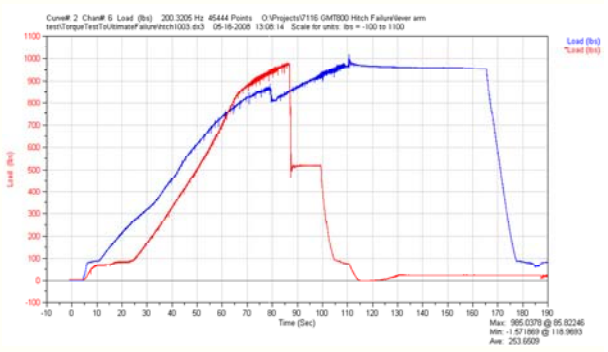
Figure 3. Static Overload Tests

HD Overload Torque Test with Lever

Torque Required to Fail Receiver Twisted About the Longitudinal (X) Axis and Vertical (Z) Axis

Longitudinal Axis Torque Test

Long. Axis (X) Max. 11,800 ft-lbs.



Vertical Axis Torque (Lateral Bending) Test

Vertical Axis (Z) Continued Plastic Deformation

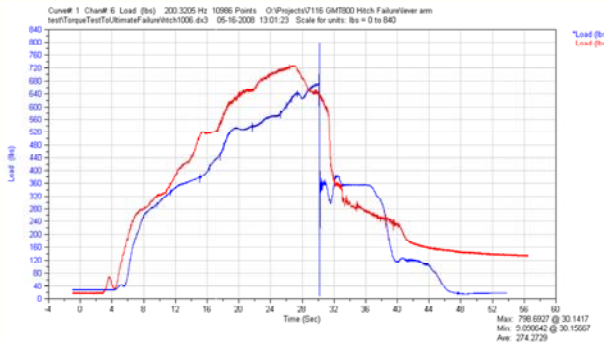


Figure 4. GMT800 Series Instrumented Dynamic Towing Tests

Dynamic Test Series

- Curb Backover – Parallel to 6” curb, turn and reverse
- Slalom – 100 foot spacing at ~30 MPH
- Panic Braking – With and without trailer brakes
- High Articulation Turns @ 10 MPH – Lock-to-Lock with 3 Second Dwell
- Bus Truck Durability
  - Turtleback
  - Staggered Bumps
  - Washboard
  - Four Inch Deep Chuckhole
  - Staggered Chuckholes
  - Sine Waves
  - High Crown Intersection

Figure 5. Aftermarket Weight Distributing Systems

Hitch Aftermarket Weight Distributing Receiver Couplers Tested

- **Drawtite** (Cequent/ Reese/ Hidden Hitch) w/Sway Control

- **Hensley-Arrow** w/Sway Control

Figure 6. Instrumentation at the Hitch Receiver Box

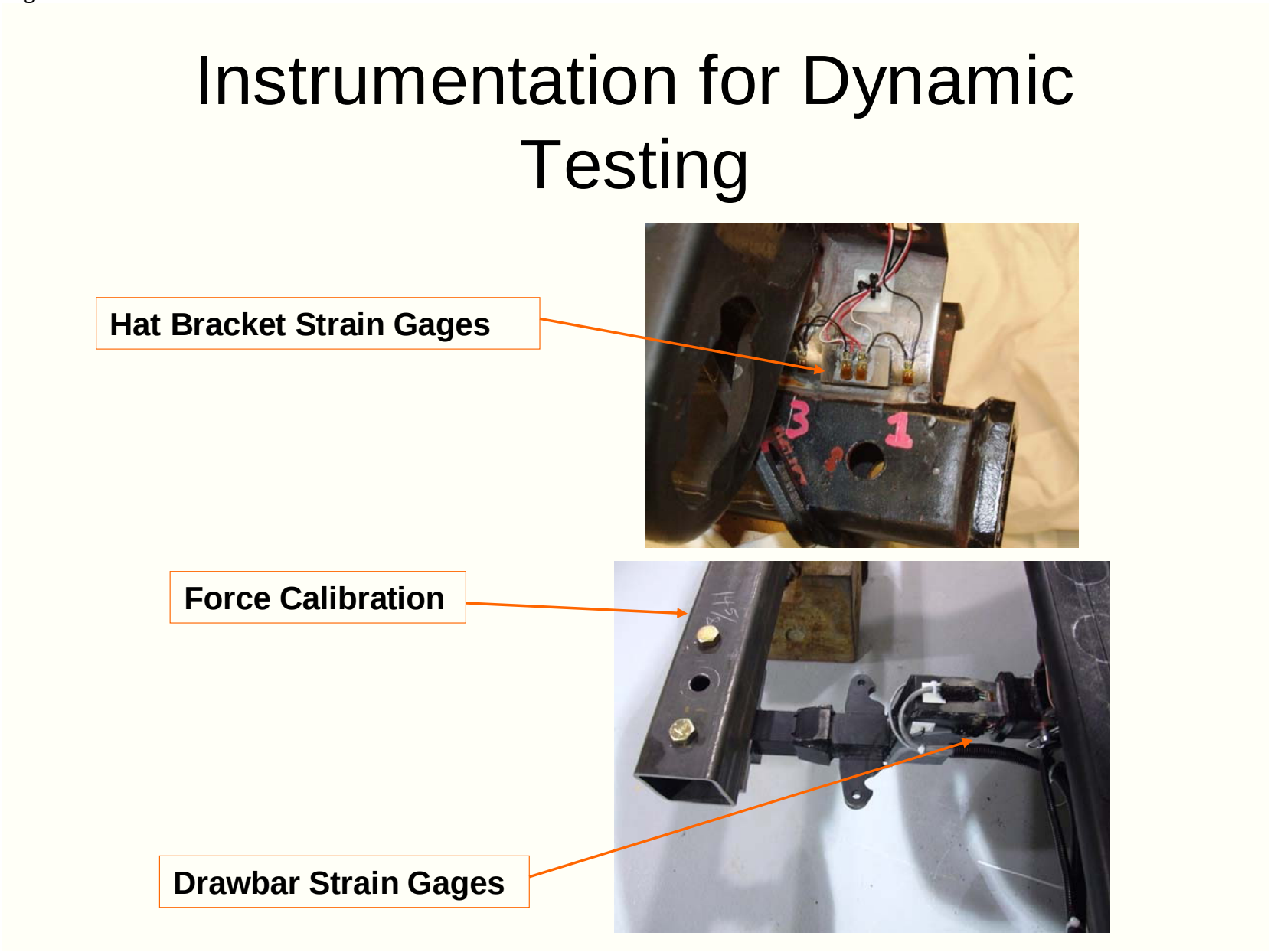


Figure 7. GMT800 Fatal Crash Analysis (while towing a trailer)

FARS Analysis Summary

- **NCSA FARS Data Search – GMT800 Series SUV/PU involved in fatal with towing factor as an issue identified (1999-2005)**
  - **FARS identified 11 GMT800 cases and obtained additional information on 6 cases:**

Tow Veh	Failure Mode	Trailer Condition	Position of Fatal Occupant?	Hitch Issue?	Causation Factors?	Notes
GM 2000 SUV	Unhitched from Mount	Trailer separated & impact oncoming veh	Driver of oncoming vehicle	No	Improper hitch setup	NA incident
GM 2002 SUV	Trailer tipped on side and hitch broke at receiver	Trailer separated and stayed on roadway	Left Middle Row	No	Veh sway > LOC> RO> Ejection>Fatal	NA incident
GM 2003 PU	Unhitched from Mount	Trailer separated & impact oncoming veh	Driver of oncoming vehicle	No	Improper hitch setup	NA incident
GM 2000 PU	Unhitched from Mount-no safety chain, impr latching	Trailer separated & impact oncoming veh	Driver of oncoming vehicle	No	Improper hitch setup	NA incident
GM 2001 PU	Unhitched from Mount-no safety chain, impr latching, no trailer brakes	Trailer separated & impact oncoming veh	Driver of oncoming vehicle	No	Improper hitch setup	NA incident
GM 2002 PU	Towing an inner tube by rope on roadway in snow condition	Deceased riding on tethered inner tube swayed into and struck oncoming ATV	On a tethered inner tube	No	Unauth person and device hanging on vehicle	NA incident

Note: LOC = Loss of Control
RO = Rollover