FREIGHTLINER LLC

Nasser Zamani
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Freightliner LLC
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December 14, 2007

Dan Smith
Associate Administrator for Vehicle Safety
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

07V-592
(25 pages)

Re: Defect Information Report FL-519, TRW TAS85 Steering Gear Assembly

Mr. Smith:

In accordance with Part 573 of Title 49 of the Code of Federal Regulations, Freightliner LLC herewith reports a safety campaign to recall approximately 220 Freightliner, Western Star, Sterling trucks manufactured May 2007 to November 2007 which may contain a defect in the TRW TAS85 steering gear assembly.

Attached are Freightliner's Defect Information Report and the TRW Defect Information Report.

Please contact me if you have any questions.

Sincerely yours,

Nasser Zamani

Cc: Michael Mason, CAL-OSHA
Enclosure
Certified Mail# 7004 2890 0004 1202 1208

FREIGHTLINER LLC

Defect Information Report

(Section 573.6)

December 14, 2007

(c)(1) Manufacturer: Freightliner LLC
P.O. BOX 3849
Portland, Oregon 97208
(503) 745-5219

Brands: Freightliner, Western Star, Sterling

(c)(2) Vehicles identification:

Model(s) affected:
Freightliner – Argosy, Cascadia, Columbia, Century ST, Coronado, FLD (glider), FLD SD, Classic, Classic XL, Business Class M2
Western Star – 4900
Sterling – A-Line, L-Line
Model Years affected: 2008
Manufacture Dates: May 2007 to November 2007
Basis for determining population: Certain vehicles manufactured with TRW TAS85 steering gear assemblies. TRW identified the serial numbers of the gear assemblies that may contain the defect. Freightliner production records will be used to identify the vehicles.
Component manufacturer if other than the vehicle manufacturer:
TRW Automotive
12001 Tech Center Drive
Livonia, MI 48150

(c)(3) Total number of vehicles potentially affected: Approximately 220 in the United States. Most gears identified by TRW were installed on trucks manufactured for export markets.

(c)(4) Percentage of vehicles estimated to contain the defect: See attached Defect Information Report from TRW Automotive.

(c)(5) Description of the defect: See attached Defect Information Report from TRW Automotive.
49CFR Section 577.5(f) Evaluation of the risk to motor vehicle safety: See attached Defect Information Report from TRW Automotive.

(c)(6) Chronology of principal events: See attached Defect Information Report from TRW Automotive. Freightliner received a copy of the TRW Defect Information Report November 30, 2007.

(c)(7) Noncompliance-test or other data: not applicable

(c)(8) Remedial program: Repairs will be performed by Freightliner dealerships and Direct Warranty customers, i.e., customers approved by Freightliner to do their own warranty repairs. The steering gear assembly will be replaced if it is included in the list of steering gear assembly serial numbers identified by TRW that may contain the defect. Dealer notification will be complete February 8, 2008.

Estimated Owner Notification Date: Customer notification will be by first class mail using Freightliner records to determine the customers affected. This will be completed approximately February 8, 2008

Reimbursement Plan: All prior repairs, if any, have been competed under warranty.

(c)(9) Information for tire recalls: not applicable

(c)(10) Communications sent to dealers and owners: Copies will be submitted as a supplemental report when available.

(c)(11) Copy of proposed owner notification letter: A draft will be sent for ODI review when available.

(c)(12) Manufacturer's campaign number: FL-519

TRW Automotive

12001 Tech Center Drive
Livonia, MI 48150

November 26, 2007

Daniel C. Smith
Associate Administrator for Enforcement – NVS-200
National Highway Traffic Safety Administration
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Re: Defect Information Report

Dear Mr. Smith:

TRW Automotive U.S. LLC ("TRW") has determined that a defect that relates to motor vehicle safety may exist in certain steering gears manufactured by TRW between August 17, 2007 and September 13, 2007. These steering gears contain potentially defective sector shafts produced by TRW between August 13, 2007 and September 13, 2007. All of the steering gears covered by this determination were provided to manufacturers of large trucks for use as original equipment. This notification is being provided in accordance with 49 CFR Part 573.

Manufacturer's name § 573.6(c)(1)

TRW Automotive U.S. LLC

Identification of potentially defective components § 573.6(c)(2)

The items of equipment subject to this determination are TRW TAS85 and RCS85 steering gears containing potentially defective sector shafts manufactured by TRW between August 13, 2007 and September 13, 2007. All of the steering gears covered by this determination were shipped to vehicle manufacturers (OEMs) for use as original equipment on commercial trucks. The suspect population was determined from review of manufacturing records. The suspect steering gears can be identified by date code and serial number.

TRW cannot be certain exactly which of the TAS85 and RCS85 steering gears manufactured during this time period contain the defective sector shafts. Therefore, to assure that all of the defective sector shafts are covered, this determination covers all of the steering gears manufactured by TRW during that time period that could possibly contain one of the defective sector shafts.

The names, addresses, and telephone numbers of the OEMs that have received the steering gears covered by this determination are contained in the attached Exhibit A.

Total number of items potentially containing the defect § 573.6(c)(3)

This determination covers 1647 potentially defective steering gears shipped to OEMs in the United States.

Each steering gear contains one sector shaft. A total of 1650 potentially defective sector shafts were assembled into a total of 3138 TAS85 and RCS85 steering gears between August 17, 2007 and September 13, 2007, and shipped by TRW to OEMs, both in and outside of the United States. As noted above, TRW cannot be certain exactly which of the TAS85 and RCS85 steering gears manufactured during this time period contain the 1650 potentially defective sector shafts.

Of the 3138 steering gears that may contain a defective sector shaft, 1647 were shipped to OEMs in the United States (the remaining 1491 steering gears were shipped to OEMs outside of the United States). TRW does not know how many of the 1647 units shipped to U.S. OEMs have been installed on vehicles by those OEMs, or how many vehicles with potentially defective steering gears have been sold to ultimate consumers by the OEMs.

Percentage of items of equipment that actually contain the defect § 573.6(c)(4)

Based upon the fact that approximately 52 percent of the 3138 steering gears produced during this period contain a potentially defective sector shaft, TRW believes that approximately 52 percent of the 1647 steering gears covered by this determination actually contain the potential defect.

Description of defect § 573.6(c)(5)

The inner surface of the outer sector shaft teeth may have an incorrect gear tooth involute profile. The incorrect gear tooth involute profile was produced with an incorrect gear shaper cutter. The incorrect gear tooth involute profile on the defective sector shafts may interfere with the rack-piston teeth, resulting in a "stick or bind" condition. This condition has the potential to cause the steering gear to stall and restrict the steering turning angle of the vehicle at about 1.25 steering wheel turns into a turn, out of a total available of 2.5 to 3.0 steering wheel turns in either direction.

Chronology of principal events § 573.6(c)(6)

On September 13, 2007, during normal TRW in-process production line testing, TRW identified the incorrect sector shaft gear tooth involute profile. TRW did not ship any suspect steering gears, containing potentially defective sector shafts, after September 13, 2007. TRW immediately initiated a containment activity within TRW and began an investigation of this issue. TRW's investigation and testing were completed on November 16, 2007. From the information gathered during the investigation, TRW concluded that the suspect sector shafts appear to contain a defect relating to motor vehicle safety. This determination followed.

Description of manufacturer's program for remedying the defect § 573.6(c)(8)(i)

TRW has initiated oral contacts with manufacturers to which the potentially defective units were sent, advising them of the issue, requesting that the potentially defective units be quarantined, and requesting that any vehicles already equipped with the potentially defective units not be shipped to dealers or sold to customers. Any future recalls of trucks containing these steering gears will be conducted by the OEMs.

Representative Copy of all Notices, Bulletins, and Other Communications § 573.6(c)(10)

Pursuant to § 573.6(c)(10), attached as Exhibit B to this Defect Information Report is a representative copy of a communication sent to more than one vehicle manufacturer relating to this matter.

If you would like any additional information regarding this issue, please contact Jeff Cooper at 734-855-2672.

Sincerely,

TRW Automotive U.S. LLC

Jeffery M. Cooper
Assistant Secretary

Cc: George Person, Chief of Recall Management Division

Exhibit A

Name	Address	Telephone	No. of Steering Gears with suspect TAS85 and RCS85 Sector Shafts
Dynacraft Div. PACCAR Inc.	650 Milwaukee Ave. N. Algona, WA 98001	253-333-3011	50 units shipped to US locations
Freightliner LLC	4747 N Channel Ave. Portland, OR 97217	503-745-8000	287 units shipped to Canadian location, 593 shipped to Mexico locations, 770 units shipped to US locations.
Kenworth Mexicana S.A. de C.V.	Km. 10.5 Carret San Luis Mexicali, B.C. Mexico 21100	52 6 562 8080	203 units shipped to Mexico
Kenworth Truck Co.	64 Canterbury Road Bayswater, Vic. Australia 3153	61 3 9721 1500	308 units shipped to Australia
Kenworth Truck Co.	10630 N.E. 38th Place Kirkland, WA 98033	425-828-5000	75 units shipped to US locations, 1 unit shipped to Canadian location.
Monaco Coach	91320 Coburg Industrial Way Coburg, OR 97408	541-686-8011	111 units shipped to US location.
Motor Coach Industries	1700 East Golf Road Schaumburg, IL 60173	800-743-3624	30 units shipped to Canadian location.
National Oilwell Varco	11659 US HWY 60 West Pampa, TX 79065	806-665-3701	38 units shipped to US location.
Paccar Parts Div. of PACCAR Inc.	750 Houser Way N. Renton, WA 98055	425-254-4200	63 units shipped to US locations, 3 units shipped to Canadian location.
Peterbilt Motors Co.	1700 Woodbrook St. Denton, TX 76205	940-483-0171	151 shipped to US locations.
Pierce Manufacturing	2600 American Drive Appleton, WI 54912	920-832-3391	53 units shipped to US location.
Prevost Car	35 Gagon Blvd. Saint –Claire, Quebec, Canada G0R 2Y0	418-883-3391	9 units shipped to Canada
SAF-Holland, USA, Inc.	1050 Industrial Blvd. Muskegon, MI 49443	231-773-3271	18 units shipped to US location.
Seagrave Fire Apparatus, LLC	105 East 12th St. Clintonville, WI 54929	715-823-2141	25 units shipped to US location.
Spartan Motors, Inc.	1000 Reynolds Road Charllotte, MI 48813	517-543-7747	262 units shipped to US location.
Sutphen Corporation	7000 Columbus-Marysville Road Amlin, ON 43002	800-848-5860	18 units shipped to US location.
Volvo de Mexico Div. Autobús (Nova Bus)	Lago de Guadalupe, #289 Fradd, Idn. Cartagena, Tuititlan, edo. de Mexico, C.P. 54900	52 5550 90 37 00	57 units shipped to Mexico location.
Volvo Trucks North America	PO Box 6115 Greensboro, NC 27402	336-393-2000	13 units shipped to US location.
			Total steering gears shipped to U.S. locations: 1647

Exhibit B

See attached.

TRW

safety.

TAS 85 & RCS 85 Steering Gear Issue Summary

November 19, 2007

TAS 85 & RCS 85 Issue Discussion Outline

1.0 Introduction

2.0 Issue Description

3.0 Issue Cause

4.0 Chipped Shafts In Gears

5.0 Customer Return

6.0 Suspect Population

7.0 Engineering Investigation

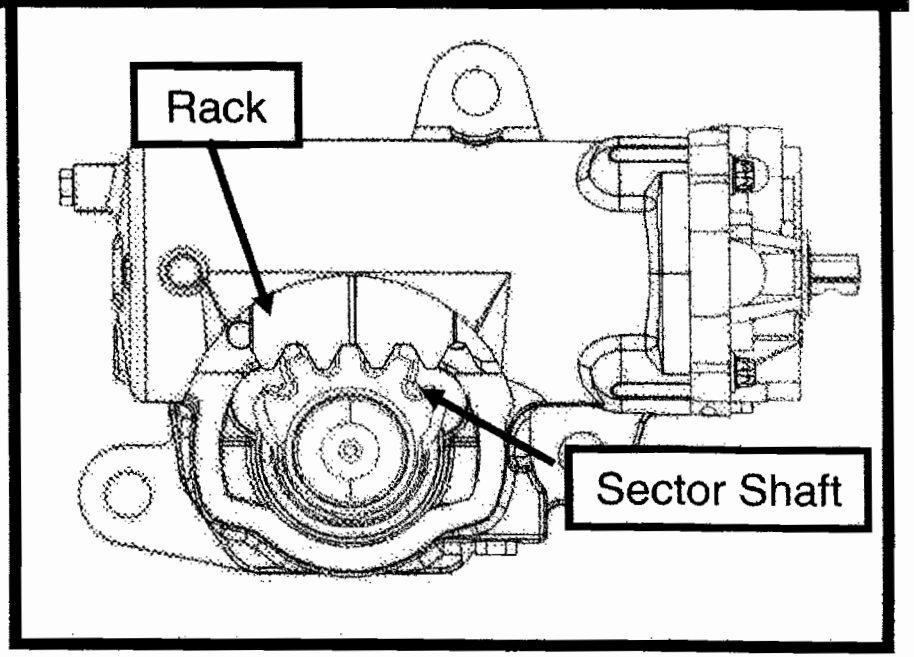
- 7.1 Durability Test Results
- 7.2 Contamination & "Chipping"
- 7.3 Results of Verification Testing
- 7.4 Additional Durability Testing: Normal Vehicle Loads
- 7.5 Lab Durability Test Of Second Six Steering Gears
- 7.6 Demonstrated Occurrence Rate

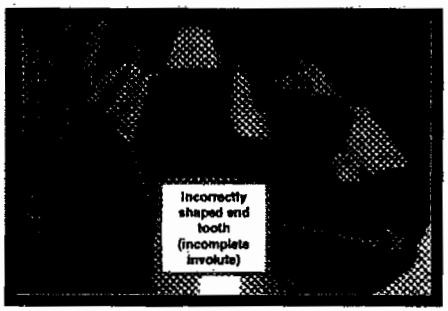
8.0 Corrective & Preventative Actions

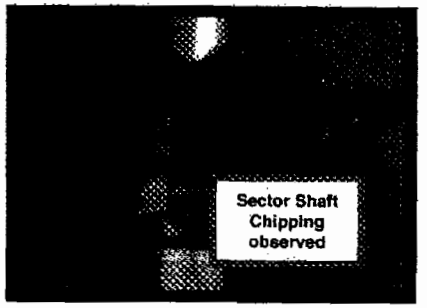
9.0 Conclusions

1.0 Introduction:

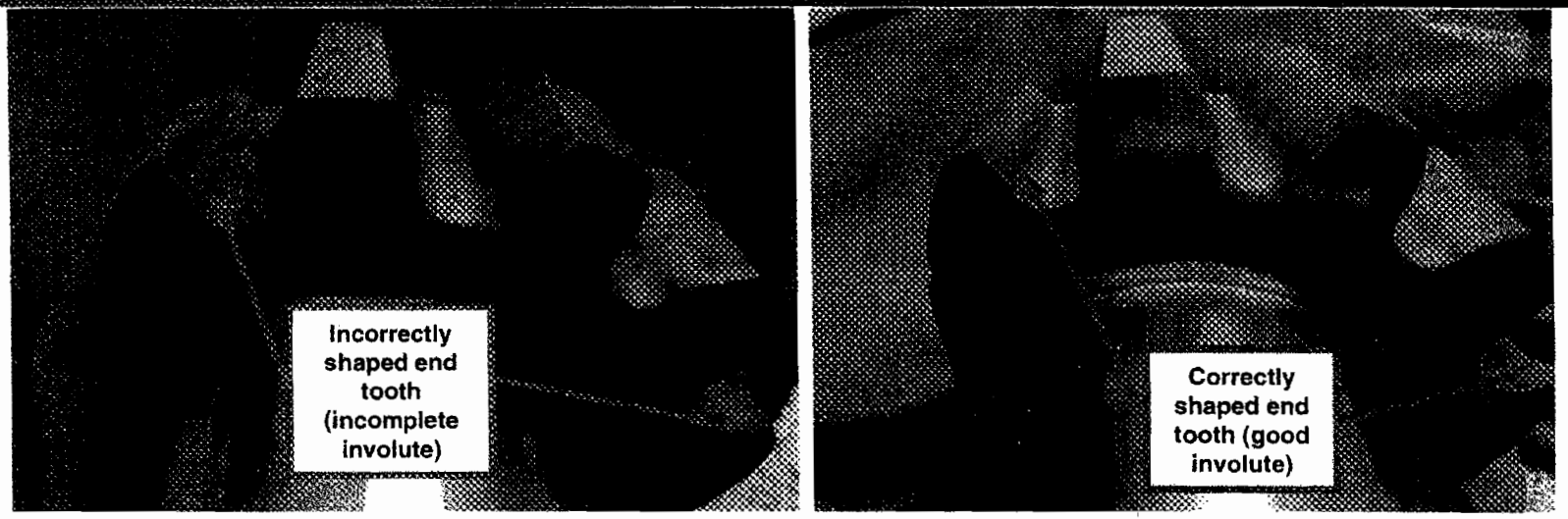
- Suspect parts produced at the Lebanon, TN Plant
- Issue discovered during normal in process testing tear-down audit on Sept 13.
- The sector shaft teeth were machined with an incorrect gear shaper, leaving excess material on face of teeth.
- The excess material causes an interference between the rack teeth involute profile and the sector shaft teeth, leading to a "stick-bind" condition.
- The interference can cause chips of hard material to break off of the sector teeth.
- The chips of material, in some applications, can stay within the tooth system, being crushed by the gear or limiting the gear's travel

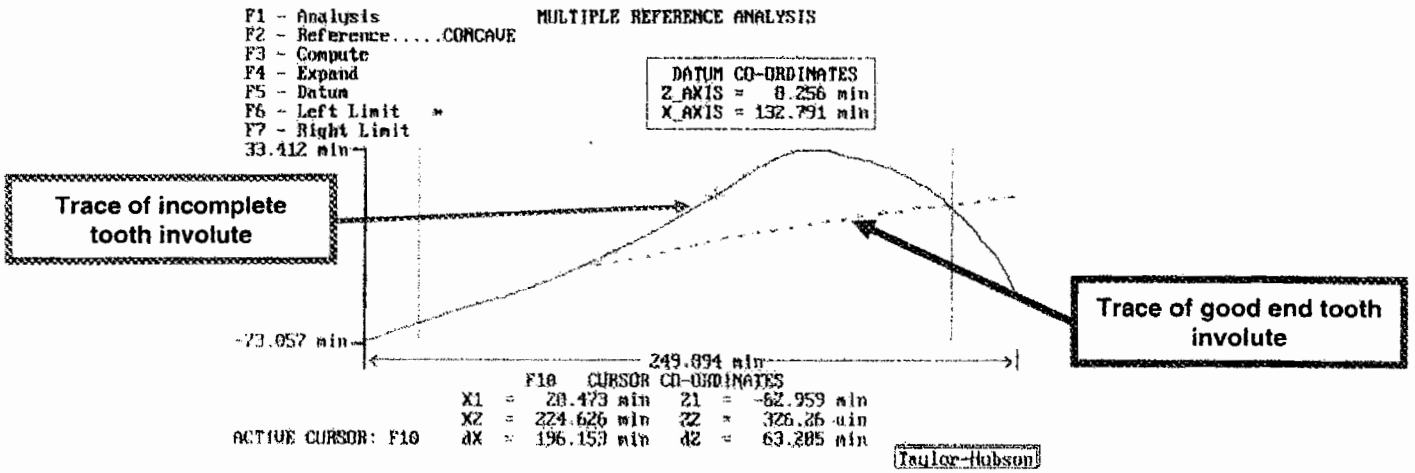




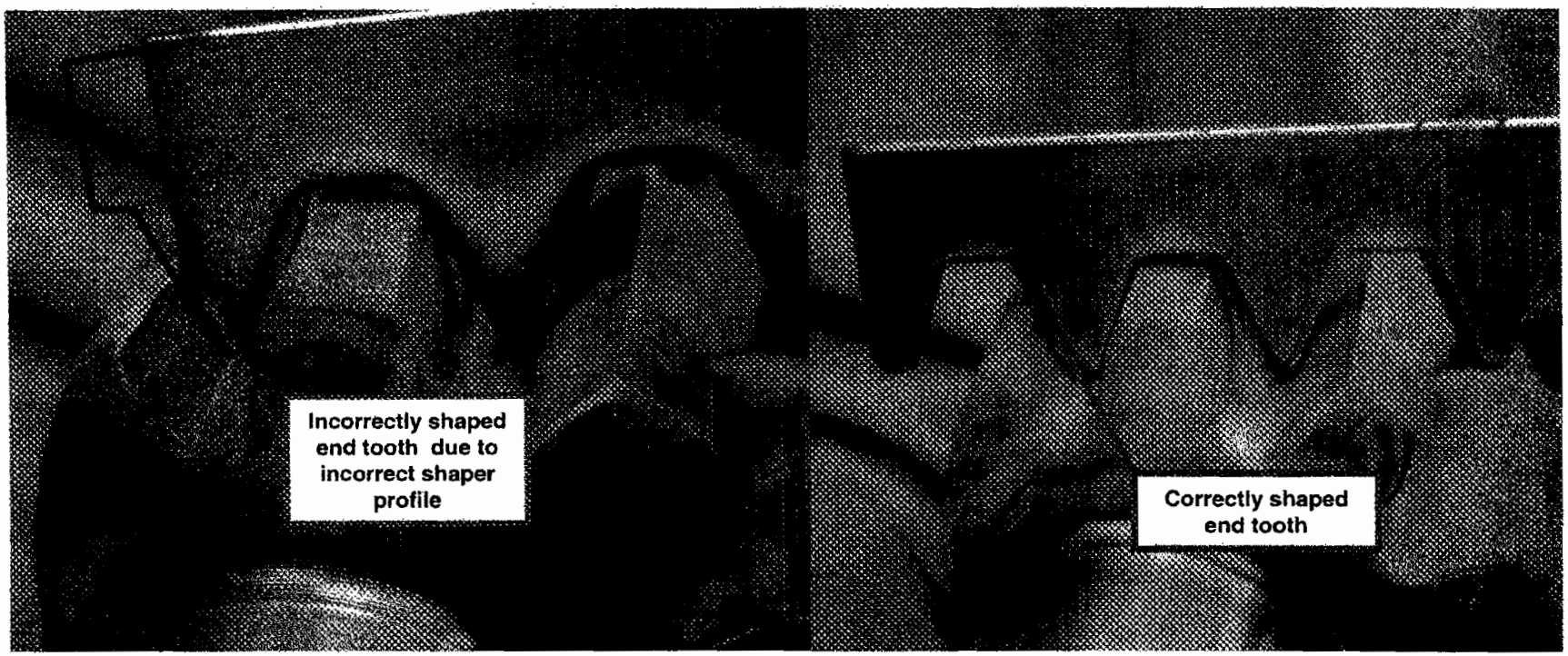


2.0 Issue Description
Incorrect Involute Profile on Sector Shaft





3.0 Issue Cause

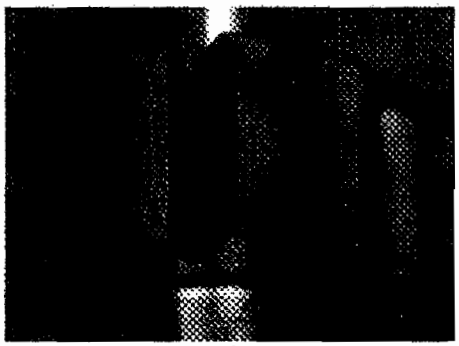


- **Incorrect tool design of shaper**
  - **New 3 Tooth Cutter design had a truncated end tooth shown**
  - **TRW profile gaging method did not identify this condtion**

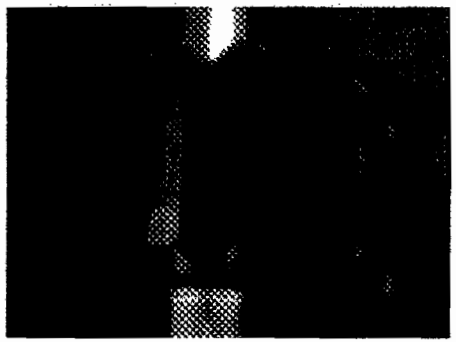
4.0 Chipped Shafts In Gears

100 Quarantined suspect sector shafts were examined after normal production processing and categorized as follows:

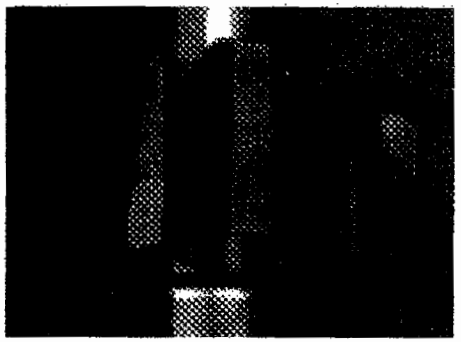
• No evidence of chipping	40
• Small Chip	22
• Medium Chip	38
• Severe chipping and/or broken teeth	0



No Chip



Small Chip



Medium Chip

5.0 Customer Return
Build Date Sept. 6th

1. One TAS 85 steering gear was found during normal OEM assembly processes by an OEM with complaints of limited travel during axle stop setting.
   - The gear was returned to TRW per their normal return process
2. TRW analysis shows that the gear has the manufacturing issue.
   - The gear is binding due to the interference issue and not a chip.
   - Chips were found in the gear, similar to TRW's findings.
3. TRW analysis completed Nov. 1
4. Data from this was used to augment TRW's investigation.

6.0 Suspect Population:

Population:

1. **1,650 sector shafts in 3,141 suspect steering gears shipped.**
2. **The incorrect "3-Tooth" Cutter was first used in production on August 13th, 2007.**
3. **The suspect sector shafts were assembled into TAS 85 & RCS 85 steering gears starting on August 17th, 2007.**
4. **4,080 Suspect "3-Tooth" sector shafts were produced until the TRW in-plant tear-down audit found the condition on Sept. 13th .**
    1. **2,430 Gears with suspect sector shafts were quarantined by TRW.**
    2. **The 1,650 were shipped prior to the quarantine.**
5. **All shipped steering gears passed TRW's production testing screens.**
6. **Due to multiple cutters running production at this time, the 1,650 suspect shafts are built into 3,141 gears.**

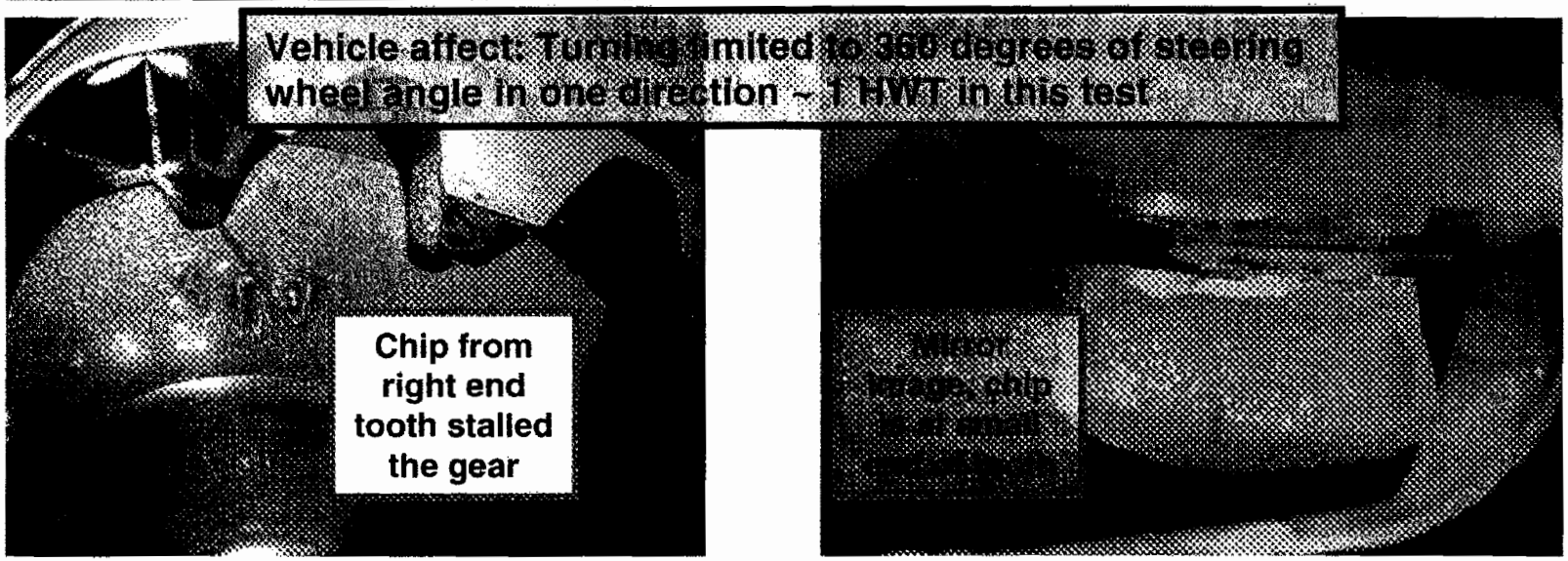
7.0 Engineering Investigation:

1. Based on the discovery of the incorrect involute profile, TRW engineering conducted the following:
2. Reviewed the related Design & Process FMEAs and found that this condition (tooth breakage) was anticipated and was assigned an 8 for severity: "Vehicle / Item inoperable, with loss of primary function"
3. Initiated the verification of potential degradation and actual failure modes.
   - TRW conducted the "30,000 Cycle Durability Wear (1 life) Test" on 6 steering gears at full power & 6 steering gears at normal loading.
4. Results follow:

7.1 Durability Test Results: Full Power
6 30,000 Cycle Wear Tests: 5 complete, one stall

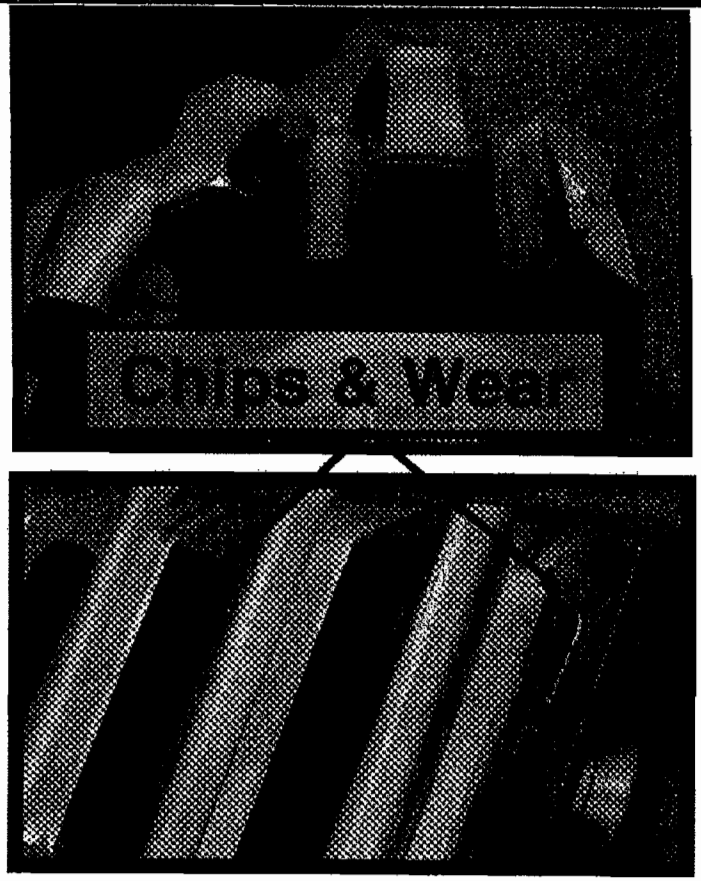
Test Number	Status
8684	Completed 30k Cycles
8700	Completed 30k Cycles
8701	Completed 30k Cycles
8702	Completed 30k Cycles
8703	Completed 30k Cycles
8704	Stalled @ 4,541 Cycles

Stall is defined as the inability of the gear to steer full rated load within prescribed 2,175 PSI pressure rating.



7.2 Contamination & "Chipping": Full Power

Wear Test Generated Damage during Life test

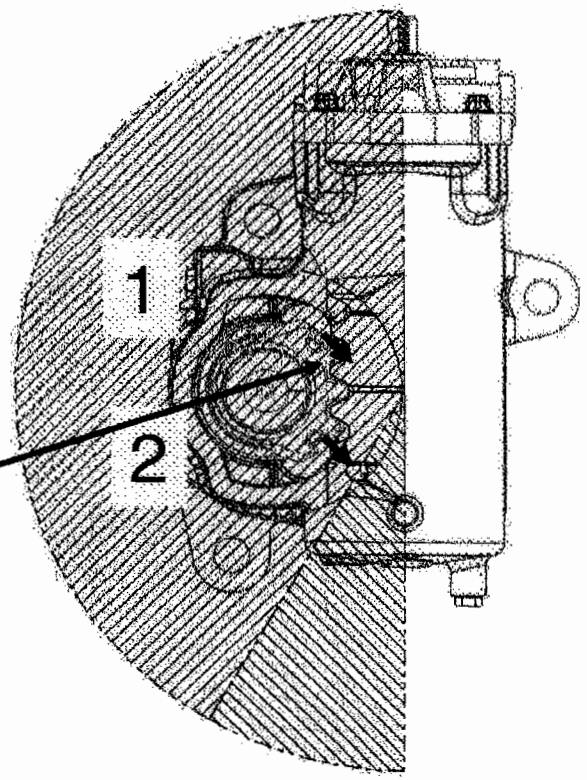


1. All gears had chipping and crushed contamination
2. All gears had tooth and rack wear
3. The test stand stalled preserving the chip, which could be crushed in a controlled test later.

7.3 Results of Verification Testing: Full Power

Low Probability of Inoperable Condition

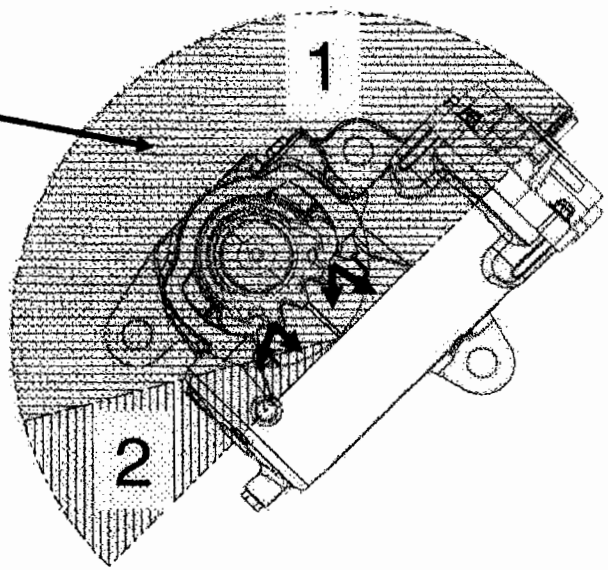
1. 6 steering gears ran to 30,000 cycles (suspend or failure) with the nonconforming "3-Tooth" cutter tooth involute error. 1 Stalled.
2. Gear position was vertical, as shown. Chip migration varies from 1-2, 1 highest risk.
3. Chips are formed, and as they fall into gap, crushing occurs, limiting the risk in the field.
4. 1 of 6 had a "Bind/Stick" stall condition detected by the "shut-down" setting of the test stand. Position 1 confirmed.
5. The stall condition chip was later crushed.



7.4 Additional Durability Testing: Normal Vehicle Loads

1. Mount inverted @ 60 Degs., as shown which is 54% of suspect population.

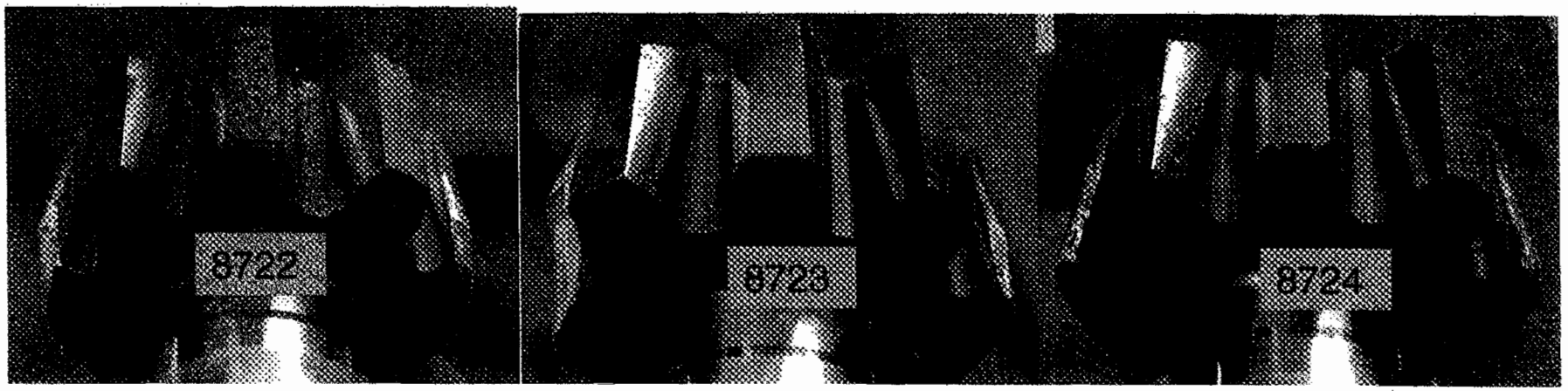
2. Six were tested at 1,100 psi load, 2,175 psi stall pump pressure, 750 in-lbs manual torque, 6 more gears.



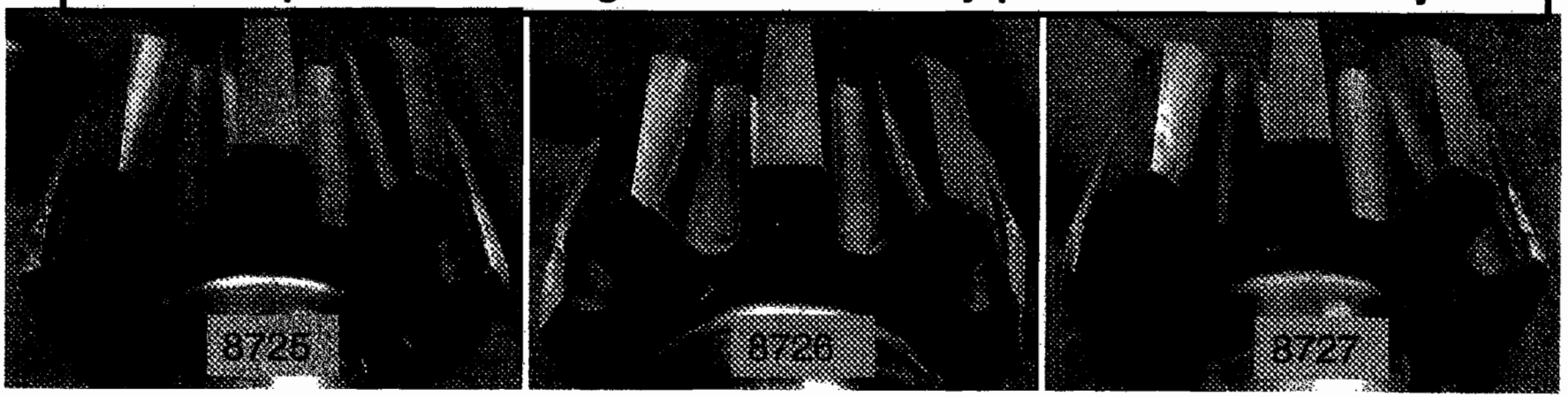
Rationale:

- Dynamic vehicle maneuvers require approximately 50% of the pressure of a static maneuver.
- Run six wear tests at 1100 psi for 30,000, compare to prior tests.

7.5 Lab Durability Test Of Second Six Steering Gears: Normal Vehicle Loads



Post test photos: All six gears successfully passed the durability test



7.6 Demonstrated Occurrence Rate

- **Involute issue exists in both ends of travel, 2 opportunities per durability cycle.**

- **Demonstrated occurrence rate at full power was:**
  - **1 Occurrence in 309,082 opportunities**
    = (5x30,000 + 1x4,541) x 2

- **Demonstrated occurrence rate at normal vehicle load was:**
  - **0 Occurrence in 360,000 opportunities**
    = (6x30,000) x 2

- **Total occurrence rate: 1 in 669,082 opportunities**

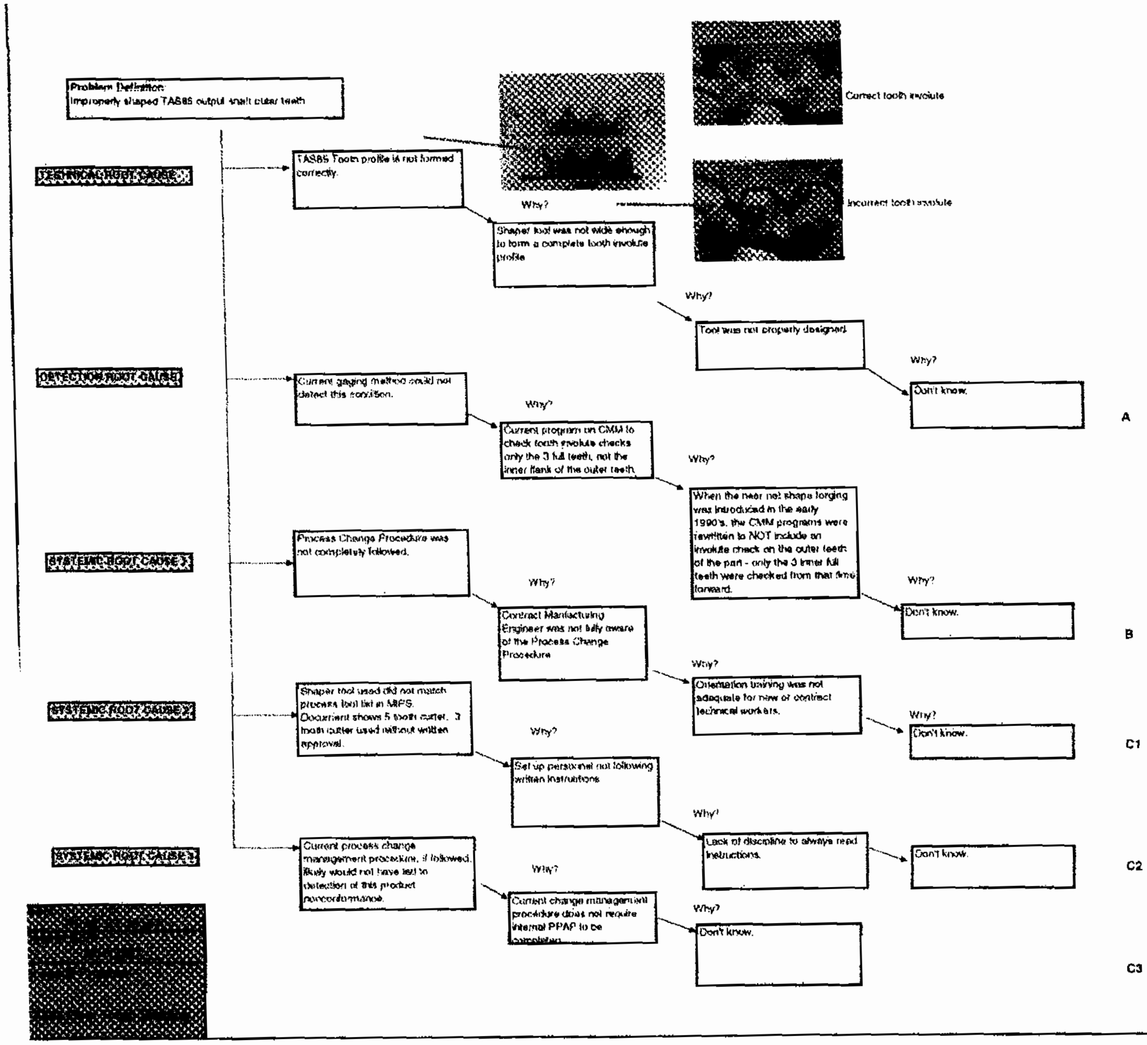
8.0 Corrective & Preventative Actions

- **Technical reason for issue:**
  - Shaper tooth cutter tool was not designed correctly.
- **Containment**
  - All three tooth cutters Quarantined
  - In-house product locked down on September 13th.
- **Systemic Quality System failure:**
  - Process Change Authorization (PCA) not followed with proper sign off by the tooling Engineer. Tool design did not follow process sign off.
  - Measuring system only verified three center teeth. The gaging process should have verified all teeth.
- **Corrective Action Measures**
  - Tooth profile measuring program changed to check all 5 sector shaft teeth vs. middle 3
  - Visual boundary samples posted at all shaper cells
  - PCA process improved and all relevant employees re-trained
  - Tooling trial process clarified
  - All hands meeting held to stress the importance of following the Quality System instructions (Salaried & Hourly)
- **Read-across audit in-process at all TRW NAS Plants**

5 Why

9.0 Conclusions

1. TRW has identified the potential issue in certain TAS 85 & RCS 85 steering gears with an incorrect involute profile lead to chipping and damage to the gearing system.
2. Durability Lifetime Wear tests have shown that the TAS 85 & RCS 85 gears will most likely crush the tooth chips seen over the life of the product's application.
3. The "Bind/Stick" condition can lead to a stall condition limiting the gear's output shaft's angular travel. Although the probability of occurrence is very low, this condition in the vehicle might lead to partial steering wheel travel, ~ 1.25 of the 2.5-3.0 turns in either direction.
4. TRW will be filing a defect and non-compliance information report with NHTSA no later than November 26, 2007, and also with other applicable (Canadian, Australian and Mexican) agencies.
5. Containment and corrective actions have been implemented.
6. TRW has 1,340 gears in finished goods available for immediate use.



Corrective Action with Responsibility	Resp	Assigned Date	Planned Date	Actual Completion Date
A - Technical				
Corrective				
1) Pulled all TAS85 3 tooth cutters from manufacturing floor	Torrey	9/14/2007	9/14/2007	9/14/2007
2) Quarantined all suspect gears and shafts	Neff	9/13/2007	9/14/2007	9/17/2007
3) Verified all shaper cutter designs for complete shaping of outer teeth. Cutter designed and one marginal design was found (TAS85)	Torrey/ Pardue	9/17/2007	9/20/2007	9/20/2007
4) Review all shaper cutter tooling to meet new design standards	[illegible]/ Smith	9/17/2007	1/15/2008	
5) Revise output shaft product print for outer teeth dimensioning and tolerancing	MacMillan/ Johnson	10/23/2007	11/12/2007	11/16/2007
6) Review all shaft & forging prints and make needed changes	Johnson/ Pardue	11/15/2007	12/16/2007	
Preventive				
1) Develop standard tool design with inspection for output shaft shaper cutters [illegible]	[illegible]/ MacMillan	9/17/2007	11/15/2007	11/15/2007
2) Train all affected [illegible] personnel	Torrey	10/26/2007	12/30/2007	
3) Review need for standard tool design with inspection for [illegible] operations	Torrey	10/26/2007	3/30/2008	
B - Detection				
Corrective				
1) Update CMM involute gauging program to check outer teeth involute - all part families. New program developed for [illegible] on 10/[illegible]/2007. Additional programs need to be written, validated and rolled out to the machine tool areas.	Torrey/ Neff/ Pardue	9/17/2007	11/16/2007	11/13/2007
2) Investigate [illegible] gage for 100% inspection	Torrey	10/24/2007	11/16/2007	11/16/2007
C1- System				
Corrective				
1) Meetings held with all ME staff to discuss departmental procedures, process change management, and tool testing requirements.	Torrey	9/17/2007	9/24/2007	9/24/2007 & 10/18/2007
Preventive				
1) Review and revise process change procedure. [illegible] procedure. [illegible] for best practice.	Torrey/ Neff	9/17/2007	11/16/2007	11/16/2007
2) When approved, all affected personnel to be trained and tested for understanding	Torrey/Neff	9/17/2007	11/30/2007	
3) Review and revise new [illegible] orientation requirements and procedures	Lean Staff	9/17/2007	11/30/2007	
4) Develop ME tool testing procedures	Torrey	9/17/2007	11/9/2007	11/7/2007
C2- System				
Corrective				
1) [illegible] Business Units to require that MPS tooling lists are followed	Butler	9/17/2007	11/16/2007	11/16/2007
2) Conduct tooling audits to MPS [illegible]. Enter MPS change requests to update necessary documentation.	Butler	9/17/2007	12/14/2007	
Preventive				
1) Add verification that MPS tool/gage list is used by set-up personnel to the LPA	Neff	10/22/2007	11/2/2007	11/2/2007
2) Procure resources to make needed updates to MPS [illegible] documents	Wilkerson	9/17/2007	10/22/2007	Ongoing
C3- System				
Corrective				
1) Require internal PPAP for all process changes [illegible]	Torrey	10/24/2007	11/16/2007	11/15/2007
2) Develop tracking database for internal PPAP	Torrey/Neff	10/26/2007	12/15/2007	
3) Review internal communication method to [illegible]	Neff/Boeck	10/26/2007	1/18/2007	