

ODI RESUME

INVESTIGATION: EA94-026

DATE OPENED: 19-JUL-94

DATE CLOSED: 28-JUL-95

SUBJECT : Inadvertent Air Bag Deployments

PROMPTED BY : PE94-023

PRINCIPAL ENGINEER: Michael Lee

MANUFACTURER : VWoA

MODEL(S) : Audi 80/90, 100/200, and V8

MODEL YEAR(S) : 1989-1993

VEHICLE POPULATION: 50,000 (approx.)

SYNOPSIS: Complaints allege that the driver-side air bag deployed without a vehicle collision.

FAILURE REPORT SUMMARY

BASIS:	ODI	MANUFACTURER	TOTAL
COMPLAINTS:	4	7	11
ACCIDENTS:	1	0	1
INJ ACCID:	0	0	0
# INJURIES:	1	5	6
FAT ACCID:	0	0	0
# FATALS:	0	0	0
OTHER:	0	0	0

DESCRIPTION OF OTHER:

ACTION: Close this Engineering Analysis.

ENGINEER

M. Lee
7/28/95
DATE

BRCH CHF

Thomas Lopez
7/28/95
DATE

OFC DIR

[Signature]
7-28-95
DATE

SUMMARY: This Engineering Analysis (EA) is closed. See the EA Closing Report for details.

*724
8-7-95*

ENGINEERING ANALYSIS CLOSING REPORT

SUBJECT: Alleged Inadvertent and Oversensitive Air Bag Deployments in Certain 1989-93 Audi Vehicles

EA No.: EA94-026

Date Opened: 7/19/94

Date Closed: JUL 28 1995

BASIS: This Engineering Analysis was opened on the basis of the analysis of the information obtained during PE94-023.

THE ALLEGED DEFECT: The air bag system equipped in the subject vehicles may deploy inadvertently while driving or idling (no impact), or from undercarriage impacts.

DESCRIPTION OF THE AIR BAG SYSTEM: The system uses a single-location sensor unit located on top of the transmission tunnel. The sensor unit contains an electronically-controlled crash sensor and a safing sensor, a Mercury switch. The subject vehicles are equipped with driver-side air bags.

CORRESPONDENCE:

			Confidentiality		
NHTSA to Mfr.	Mfr. to NHTSA	Mfr. to NHTSA (Supplement)	Date Requested	Date NCC Response	Items Confidential
8/17/94	10/12/94	None	N/A	N/A	None
2/14/95	4/12/95	5/5/95	N/A	N/A	None

STATUS:

	EA Opened		EA Closed		
	ODI	Mfr.	ODI	Mfr.	Total
Reports	3	4	4	7	11
Owner	3	4	4	7	11
Field	0	0	0	0	0
Lawsuits	0	0	0	0	0
Accidents	0	0	1	0	1
Injuries	1	3	1	5	6
Fatalities	0	0	0	0	0

VEHICLE POPULATION:

MY\Model	80	90	100	200	V8	Total
1989	0	10	90	1,952	0	2,052
1990	4,716	3,796	8,604	2,331	2,956	22,403
1991	2,071	1,562	6,719	2,349	550	13,251
1992	549	0	10,620	N/A*	N/A*	11,169
1989-92	7,336	5,368	26,033	6,632	3,506	48,875

* MY 1992 S4 (new model name replacing 200) and V8 vehicles have different sensor units than the subject vehicles.

NOTE: Not shown in the table are certain MY 1993 Audi 80/90 vehicles through VIN "PA049999" which have the identical sensor units as the subject vehicles.

WARRANTY:

Part Name\MY	1989	1990	1991	1992	1993	1994
Air Bag	2	11	7	3	12	4
Trigger/Sensor Unit (Control Module)*	9	73	54	26	8 (90)	0 (65)
Energy Reserve Unit	12	40	26	5	3	0
Voltage Transformer	13	51	30	10	5	0
Spiral Spring	120	1,022	652	667	871	517

* New sensor system (referred to as control module) was introduced in most of MY 1993 Audi vehicles which were equipped with dual air bags.

NOTE: Warranty claims shown above are from August 1989 through March 1995.

PART SALES:

Part Name	Part Number	Sales (3/90-9/94)	Vehicle Application	Comments
Driver Air Bag	443 951 52H 01C	645	All	--
Passenger Air Bag	441 880 203	120	(2)	--
Trigger/Sensor Unit	443 959 655E	628	(1)	--
Control Module	4A0 959 655	153	(2)	--
Energy Reserve Unit	443 959 659	274	All	--
Voltage Transformer*	443 959 663	126	(1)	Valid until 12/90
	443 959 663B	81	(1)	Valid from 1/91
Spiral Spring	443 951 543B	1,079	All	Valid until 3/91
	4A1 951 543	2,792	All	Valid from 4/91
Wiring Harness	447 971 315CJ	10	(1)	--
	447 971 315CK	12	(1)	--
	4A1 971 581E	24	(2)	--

All = MY 1989-94 Audi vehicles with driver or dual air bags.

(1) = MY 1989-92 subject vehicles with driver air bags (Air Bag 1 System).

(2) = MY 1993-94 Audi vehicles with dual air bags (Air Bag 2 System).

* Control module includes voltage transformer for Air Bag 2 System.

SERVICE BULLETINS:

Audi did not issue any service bulletins that relate to the alleged defect.

DESIGN, MATERIAL, AND/OR PRODUCTION MODIFICATIONS:

Audi and Bosch did not make any changes or modifications that relate to the alleged defect.

TESTING:

NHTSA or its contractors did not conduct any testing.

WARNING SYMPTOMS:

Air bag (SRS) indicator light, in some cases, may activate to indicate a problem with the air bag system. Audi owner's manual states that if the light comes on while driving, does not come on when the ignition is switched on, or does not go out after about ten seconds with the ignition on, this indicates a malfunction in the air bag system. If any of these conditions occur, it says to have the system inspected by an Audi dealer, otherwise, the air bag may not function properly in a frontal collision. The manual, however, does not say the air bag may inadvertently deploy.

ODI ANALYSIS:

There are eleven reports of non-collision air bag deployments involving the subject vehicles (MY 1989-92 all Audi models). Eight were non-impact, two were undercarriage impacts, and one was alleged inadvertent air bag deployment causing an accident.

Of the eight non-impact cases, four occurred while driving forward, two, while driving in reverse, and two, while stopped (idling). In four of the eight cases, the SRS indicator light was reportedly on prior to the incident. Audi's inspections of the eight vehicles revealed no vehicle impacts. In five of the eight cases, specific defects have been identified within the sensor units. In three of the five cases, there was evidence of electrolyte leakage from the memory cell within the sensor unit. In two of the three cases, a failure in the crimping of the memory cell housing was noted to be the leakage location, whereas in one case, the leakage was caused by an electrical overload of the memory cell due to a cold solder point on the memory cell circuit. In all three cases, the leaked electrolyte probably caused a bridge

between two ignition points on the circuit board of the sensor unit and caused a short circuit. In the fourth case, the wire at a connection point (ignition circuit) within the connector for the sensor unit was improperly trimmed, making contact to the adjacent connection point (battery positive) and causing a short circuit. In the fifth case, a 4-mm nut was found loose inside the sensor unit. The loose nut probably caused a bridge between solder points and caused a short circuit.

In the remaining three non-impact cases, the root causes for air bag deployments are not clear, but there is evidence of some possible contributing factors. However, there is no common defect trend. In one case, the SRS indicator light activated on two different occasions and repairs were performed. Audi's inspection of the vehicle after the air bag deployment showed sensor wiring cable pinched and damaged by the mounting bracket of the energy reserve unit. A close-up photograph of the pinched portion of the wiring cable showed insulation damage and exposed wiring. Audi concluded that contact between exposed wires activated the air bag system. In the second case, similar to the first case, the SRS light activated on two occasions and repairs were performed. The spiral spring was replaced in the first repair and the energy reserve unit in the second repair. Audi speculates that there could have been wiring interference between the spiral spring and windshield wiper switch. In the third case, Audi's inspection of the vehicle showed an overheated sensor unit, and extraneous wiring for a telephone and CD player. Audi speculates that there could have been wiring interference between the air bag wiring and the aftermarket equipment wiring.

Finally, in the last three of the eleven cases, two were deployments caused by undercarriage impacts and one was alleged inadvertent deployment causing an accident. The undercarriage impacts did not appear to be severe (there were little or no vehicle repairs), but the sensors appeared to inappropriately trigger the deployment of the air bag. However, only two reports of deployments caused by undercarriage impacts do not indicate a defect trend. In the accident case, there were no information to determine if the air bag deployed inadvertently as alleged or if it deployed during the accident.

In summary, there is no defect trend in the eight inadvertent (non-impact) deployments. Three of the eight cases indicate a very similar failure mode, a leakage of electrolyte from the memory cell unit. However, although the probable defect was in the memory cell in all three similar cases, there is indication of two different failure modes as discussed earlier. In two other cases with a defect in the sensor unit, the probable causes for the deployments were unique (loose nut and untrimmed cable wire). In the remaining three of the eight cases, the root causes could not be adequately determined and there were various factors, some which could have been the result of previous improper repairs of the air bag system. Nevertheless, it appears that there is no common failure mode or defect trend in these three cases. In the last three of the eleven cases, two incidents of air bag deployments were caused by undercarriage impacts, and in one case the air bag allegedly deployed first and then caused an accident.

There were six alleged injuries from the eleven incidents of air bag deployments. Five were minor burns or bruises to arms or legs. One was a fractured left arm (unknown severity). These injuries were most likely caused by deployment of the air bags.

There were 170 replacements of the trigger/sensor units for the subject vehicles under warranty. Also under warranty, 109 voltage transformers and 86 energy reserve units were replaced. Audi stated that the reasons for the replacements were not known, only that there was a problem or malfunction with the component that the Audi dealer service personnel had identified. Because of the lack of any detailed information, no analysis of the replaced components can be made. However, it is reasonable to say that the numbers of replacements of the sensor units, voltage transformers, and energy reserve units are not very high or low when compared to each other. Based on the numbers alone, it appears that there is no indication of any problem trend that may relate to the alleged defect. There were 2,451 spiral spring replacements under warranty for the subject vehicles. This is extremely high. However, there is no evidence that the spiral spring was the cause in any of the eleven cases of inadvertent or oversensitive deployments. In addition, Audi stated that the spiral springs have a problem of being noisy when turning the steering wheel and that numerous changes were made since the first design. Because the problem of the spiral springs does not relate the alleged defect, this Engineering Analysis did not investigate the problem. However, the issue is being reviewed for possible investigation under a separate investigation.

MANUFACTURER'S EVALUATION OF ALLEGED DEFECT:

Audi states that its analysis shows that there is no defect trend. In assessing the consequences of air bag deployment, Audi states that apart from minor bruises or burns, no serious injuries have been reported and none of the drivers reported having loss of vehicle control which could have resulted in an accident. In its letter dated October 12, 1994, Audi further states that, "The evidence available to date does not indicate that the alleged defect poses an unreasonable risk to motor vehicle safety at the present time. However, Audi plans to continue to monitor the performance of its air bag systems in the field."

REASON FOR CLOSING:

At this time, the findings of the investigation do not indicate a defect trend. There is a common failure mode with only two (at most three) of the eleven reported cases that relate to the alleged defect. Therefore, further expenditure of agency resources is not recommended and this matter is closed. However, ODI will monitor any future complaint reports (to ODI and Audi) and re-open the investigation if warranted.

Michael J. Lee
Safety Defects Engineer

7/28/95
Date

I Concur:

Michael J. Lee for TZC
Chief, Vehicle Integrity Branch

7/28/95
Date

Jd
Director, Office of Defects Investigation

7/28/95
Date