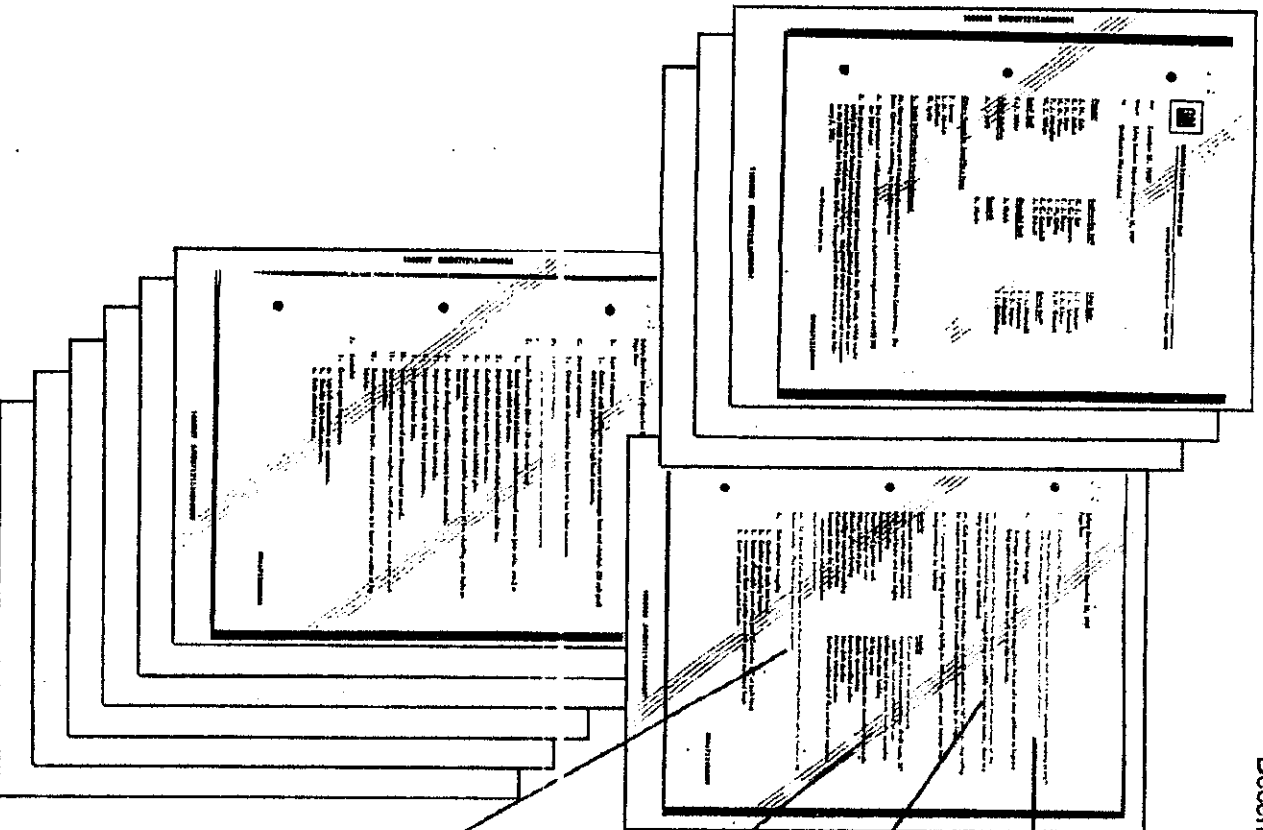


BLOW-UP

3



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3. Collapsible "A" Pillars

May be possible to design a thin tubular member that will combine adequate bending strength with the advantages of an air gap for occupant impact crush distance.

Mr. Martin discussed with the Safety Review Board:

the advantages and disadvantages of the location of the windshield header.

Dr. P. Kyropoulos discussed:

Improved rollover protection

Crash pad for front seat occupants
restraints attached to seat

Mr. Ed Klove of Fisher Body reported on their activities regarding possible safety features for future models. The following items were discussed:

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D. Roof structure integrity

1. Establish need for further improvements from field accident studies.



General Motors Engineering Staff

General Motors Technical Center, Warren, Michigan 48090

Date: December 14, 1967

Subject: Tentative Agenda "Safety Review Board Meeting" - Friday, December 15, 1967 - 1:30 P.M.

To: Distribution List Attached

AGENDA

NHS? Items

1. Status of Compliance Tests 1968 Vehicles
2. Proposed Vehicle Audit - January 2, 1968
3. Status of Plant Safety Audit
4. Research Controls
5. GM position on Dockets due February 5, 1968
6. Report on discussion of first group of Dockets - December 12, 14 & 15th.
7. Haddon's request for information on Fuel Tanks

Brake Test Procedure & Performance

 Buick Report

Discussion of Safety Concepts for a possible 1972 B-C Program

1. Bidwell - Reporting for Engineering Staff, Research, Styling & Interiors
2. Bidwell - Reporting for Engineering Staff on Injury Reduction & Accident Avoidance
3. Martin - Reporting for Research
4. Kyropoulos - Reporting for Styling
5. Klove - Reporting for Fisher Body
6. Lundstrom - Reporting for Automotive Safety Engineering

Division Items

 Race Vision Requirements - 1969

Legal Items

 Meeting with Gene Allen

Public Relations

Automotive Safety Engineering Items

1. New York Safety Car
2. Foam Filled Fuel Tanks

Fisher Body Items

Inter Organization Letters Only

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FISHER BODY "SAFETY REVIEW BOARD" AGENDA

DECEMBER 15, 1967

1. Tipping Seat and Head Rests Programs
2. 1972 Model Features
3. Roof Crush
4. Linear Shoulder Belt Retractor - Safety Standard Modification
5. Rocker Window Switch Cancellation
6. Door Latch Inertia Test Procedure Approval
7. Child Seat - Monkey Testing
8. 1969 B-C Head. Hardware
9. 1967 Strato Seat Back Lock Release

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Fisher Body	C. E. Hedeen, E. H. Klove, Jr., C. H. Schamel, K. N. Scott
Legal	F. F. Hilder, J. Quick
Public Relations	A. L. Smith
Styling	W. L. Mitchell, P. Kyropoulos, J. S. McDaniel V. D. Kaptur

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General Motors Engineering Staff

General Motors Technical Center Warren, Michigan 48090

Date December 28, 1967
Subject Safety Review Board - December 15, 1967
To Distribution List Attached

Present:

E. N. Cole
E. D. Collett
P. M. Kyes
H. G. Warner
P. J. Monaghan
W. E. Wilson

Legal Staff

F. F. Hilder

Public Relations

A. L. Smith

Engineering Staff

H. F. Barr
L. C. Lundstrom
E. J. Promo
F. M. Coffey
B. C. Parr
E. C. Campbell
J. B. Bidwell

Financial Staff

J. Quick

Research

D. Martin

Fisher Body

C. E. Hedeen
C. H. Schamel
E. H. Klave
W. M. Gossett

Styling Staff

W. L. Mitchell
P. Kyropoulos
V. D. Kaptur
S. McDaniel
J. L. Chiddister

Others Present for Specific Items

P. Bowser
L. M. Morrish
R. Hellman
G. Ryder

1. Brake Test Procedure and Performance

Mr. Bowser reviewed with the group the activities of the special GM Brake Committee. The Brake Committee is working in the following areas:

- A. The development of uniform GM tolerances above the minimum requirements of MVSS 105 for 1969 models.
- B. The development of a test procedure and performance levels for the 1970 models which would satisfy the present Federal requirements and include additional requirements which are considered desirable in evaluating a brake system. This proposal should be considered in response to the NHTS Docket 1-1 (Service Brakes - Passenger Cars) on which comments are due February 5, 1968.

Inter-Organization Letters Only

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- C. The development of a new test procedure with appropriate performance values which would be more realistic for the evaluation of brake systems than the present Federal standard. This proposal should be considered for 1971 or beyond.

Mr. Bowser expects to have recommended performance values for Item B available for the January Safety Review Board meeting. Subsequent to the meeting, the car divisions were requested by Buick to consider possible alternatives for Item B for the January meeting which are reasonable and practicable.

At the suggestion of Mr. Cole, Mr. Bowser agreed to review with the brake engineers the question of brake balance on high and low coefficient of friction road surfaces.

In developing brake performance criteria, particularly for Item B, Mr. Kyes stated that the divisions should estimate what changes might be required and possible cost for discussion at the January meeting of the Safety Review Board. The cost-safety benefit should be considered.

2. B-C Program - 1972

Mr. Rollert stated that since the 1970 program is nearing final completion, the Safety Review Board should review the safety concepts which could be considered for new 1972 model passenger cars.

The following presentations were made on safety concepts for a possible 1972 program:

A. Interior

Mr. Bidwell reported that Engineering, Styling, and Research Staffs were studying (for 1971) the interior of the vehicle to provide the best injury protection in frontal impacts for three conditions: the unrestrained, lap belted, and fully restrained occupant. The primary element for the unrestrained and lap belted occupant is the instrument panel. All instruments and controls should be in front of the driver. The panel on the passenger side should be free of all protrusions and moved rearward to provide 10-12 inches crush distance. The front seat should be a 40-60 split. This arrangement provides a means to use energy absorbing seat backs with restraint systems attached to the seats. Restraint systems should be redesigned to provide a more convenient arrangement and better storage. Higher seat backs should be considered and restraints for the rear seat should be attached to the seat.

Mr. Bidwell also reported on some of the work in process in the Development Groups at Engineering Staff. The Staff has divided the work into two categories: injury reduction and accident avoidance. In some cases, it is not essential to have a complete new vehicle before including some concepts which may provide a safety benefit.

In regard to injury reduction, the following are being evaluated:

1. Improved restraint systems. In order to take advantage of vehicle crush, complete restraint of the occupant is considered essential. We should have a system which requires very little from the user.

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2. Improved front crush.
3. Improved gasoline tank construction.

Center attention should be directed toward accident avoidance, and Engineering Staff is working on the following:

1. Handling
 - a. Uniform directional response of the vehicle.
 - b. Power steering - low gear ratio may have advantages. However, a high flow rate would be required. Also, a backup system becomes more desirable.
 - c. Leveling - improves high lateral acceleration handling and headlamp aim.
 - d. Integrated power systems - to provide adequate power for steering, brakes, and leveling. There is a need for some other source of power assist rather than vacuum.
 - e. Improved aerodynamics - to reduce disturbance response and change in vertical load distribution. Reduce pitch improves headlamp aim.

2. Tires

Since tires can affect handling, there may be a need to have tires which develop higher lateral and tractive forces. In addition, we may want to increase the cornering stiffness of tires at a faster rate with a change in load. The use of dual chamber tires should be considered to provide blowout protection provided there is no adverse effect on handling.

3. Brakes

Systems are being evaluated for improved energy dissipation and front to rear balance. Anti-lock systems are being evaluated for stability and stopping distances.

Mr. David Martin of Research reported on their study of the front end crush problem of a vehicle as it relates to body integrity and occupant protection. Work is being done in the following areas:

1. Fore Structure

It is unknown at this time as to what constitutes a desirable force distribution on the vehicle for simultaneous considerations of energy absorption and body integrity. Energy should be absorbed through the sheet metal as well as through the frame, but body integrity must be considered. The influence of various force distributions on body integrity will be studied by means of an elastic stress analysis of the body.

2. Body Integrity

An elastic stress analysis will be used to establish what body changes are desirable for improved tolerance to fore structure loads.

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3. Collapsible "A" Pillars

May be possible to design a thin tubular member that will combine adequate bending strength with the advantages of an air gap for occupant impact crush distance.

4. Axial Door Strength

A redesign of the cowl-door hinge area may allow the use of a door stiffener to improve body resistance to fare impact as well as to side intrusion.

Mr. Martin discussed with the Safety Review Board the advantages and disadvantages of the location of the windshield header. Although it may be possible to move the header, there are many factors which must be considered.

Mr. Cule stated that in addition to the header, we should consider the "A" pillars. Any rating for occupant protection should be based on overall vehicle performance in an impact.

Dr. P. Kyropoulos of Styling discussed very briefly the following exterior and interior items being considered by Styling:

Exterior

Integrated side impact structure
Helix - cable window regulator
High level brake and turn lights
Load leveling
Periscopic devices
Foam filled gasoline tank
Forward facing third seat
Pillars inboard of glass
Electric glass defrosting
Becklight wiping and washing
Flush exterior door handles
Improved design for exterior ornamentation and protrusions
Improved rollover protection

Interior

Crash pad for front seat occupants
Improved driver accommodation, 40-60 seat, 26" seat back, restraints attached to seat
Uniform type of door remote handle operation
Automatic door locking
Air bag system
Standardized location and function of controls
Electric speedometer
Remote controlled radios
New shift device
Rim horn blowing device
Further development of fire retardant material

Mr. Ed. Klove of Fisher Body reported on their activities regarding possible safety features for future models. The following items were discussed:

A. Side structure integrity

1. Continue 35 mph test level
2. Consider quartering impacts
3. Reduce allowable penetration goal (Currently 11" at belt line)
4. Increase door lock and pillar strength against outboard loads
5. Crash protected exterior handle

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- B. Rear end structure
 - 1. Consider crush modifications to reduce seat anchorage loads and whiplash (30 mph goal) and to reduce penetration at high level accidents.
- C. Front end construction
 - 1. Consider crush characteristics for best benefit to lap belted occupants.
- D. Roof structure integrity
 - 1. Establish need for further improvements from field accident studies.
- E. Interior Protection (Goal - 30 mph barrier test)
 - 1. Extend windshield skid header principle to entire roof structure (side rails, etc.) or provide added crush space.
 - 2. Improved crush of windshield pillar moulding without vision loss.
 - 3. Crushable door and quarter belt structure.
 - 4. Improved laceration resistant windshield glass.
 - 5. Protected inside door handle and possible elimination of free wheeling door locks on front doors.
 - 6. Further development of flame retardant interior materials.
 - 7. Improved window and door lock controls.
 - 8. Improved seat back top for impact performance.
 - 9. Low profile interior lamps.
 - 10. Improved performance of armrest (increased test speed).
 - 11. Seat anchorage improvement as required. This will depend on front and rear crush characteristics.
 - 12. Protection on lower seat back. Amount of protection to be based on studies of leg injuries.
- F. Restraint
 - 1. Current system improvements
 - a. Lap belt convenience and appearance.
 - b. Shoulder belt inertia retractors.
 - c. Belts attached to seat.

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2. New systems

- a. Movable instrument panel
- b. Impact table
- c. Air bag

Mr. Lundstrom presented a brief summary of the previous presentations indicating which should, according to Automotive Safety Engineering, be goals for 1972 and which should be goals for earlier models.

A. Body structure integrity

- 1. Crash protected outside handles and improved door structure - 1972.
- 2. Improved pillar strength, resistance to side penetration, improved door locks, stronger roof rail, top structure and header prior to 1972.

B. Front Crush

- 1. Provide maximum crush distance with engine consideration - 1972.
- 2. Control front crush for body integrity, front and rear bumper matching prior to 1972.

C. Rear Crush

- 1. Fuel tank over kick-up - 1972.
- 2. Trailer hitch provisions prior to 1972.

D. Body Compartment Security

- 1. Automatic locking of doors, uniform operation of door controls, combined lock button and door inner handle. Provide assist grips all passengers. Improved fire retardants all 1972.
- 2. Protection against inadvertent opening of doors - prior to 1972.

E. Instrument Panel - Header Location

- 1. Instrument panel improved energy absorption through fixed or movable panels or air bags - header located out of impact area or provided with improved skid plates and air gap crush elements - 1972.
- 2. Controls and instruments to be located or shielded out of impact area of unrestrained front seat occupants prior to 1972.

F. Restraints

- 1. Convenience and storage improvements - 1970 and 1971.
- 2. Plan for lap belt restraint only in 1972 supplemented with vastly improved forward compartment energy absorption based on fixed, adjustable, or air bag systems.

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G. Front Seats

1. Vertically adjustable driver's seat - 1972.
2. Higher seatback with head restraints - 1970. Lower seatback impact performance - 1970.

H. Controls

1. Failsafe controls, eliminate shift lever, low mass instruments, movable foot controls - 1972.
2. Standardized controls and identification, add crushable steering wheel with flexible rim - 1970.

I. Vision Forward

1. Provide unobstructed forward vision for all drivers (steering wheel below small driver eye height, mirror and header above tall driver eye height) - 1972.
2. Provide inside mirror above tall driver eye point as soon as possible all models.
3. Improve windshield washer nozzles prior to 1972.

J. Vision Rearward

1. Reduce soil panel area, provide vehicle reference - 1972.
2. Defog rear glass, provide larger mirror, provide station wagon backlight wipers prior to 1972.

K. Vehicle Braking

1. Vehicle braking - anti-locking system - 1972.
2. Failsafe power brake system prior to 1972.
3. Improved performance 1970.

L. Vehicle Handling

1. Uniform response, leveling, integrated system aerodynamic consideration - 1972.
2. Failsafe power steering and improved tire vehicle compatibility prior to 1972.

M. Tires

1. Lateral force and traction improvement - prior to 1972.

N. Lighting

1. Turnpike headlamps, burned out lamp indicator, two color rear system, running lamps, separate turn parking lamp for 1972.

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2. Instrument Illuminations, high level stop and turn lamps, dual intensity brake lamps prior to 1972.

Mr. Cole stated that we must establish the safety benefit of the items that were discussed and determine the amount of improvement that is reasonable and practicable. Everyone agreed that we must take the items one at a time and establish realistic goals. Mr. Lundstrom was requested to establish performance goals and report at the Forward Planning Meeting, January 18, 1968.

3. Radio

Mr. Riggs of Delco Radio reviewed their work on the varactor diode radio. Delco Radio is working with Buick in the installation of the varactor diode radio in the 1969 Buick Special. Buick would like to make approximately 10,000 installations in 1969 to gain some field experiences. In order to do this, Delco Radio would have to set up a small production line. Mr. Riggs presented some approximate cost figures for the varactor diode radio.

Mr. Cole questioned the need for the varactor diode radio. Before committing ourselves to this radio, we should evaluate all other alternatives, such as smaller instruments, elimination of some instruments, and relocation of present radio. GM should consider new concepts for instruments and controls. It is considered highly desirable to locate all instruments including the radio behind the steering wheel and improve the servicing of instrument panel items.

Mr. Rollert asked Delco Radio to consider a redesign of the present radio to make it smaller so that it could be located behind the wheel and to offer suggestions on redesign of other controls for miniaturization.

4. Child Safety Seat

Fisher Body reported that Dr. Muelke suggested that GM should conduct tests on the child safety seat using monkeys. Fisher Body obtained approval to determine how additional tests could be conducted on the child safety seat.

5. Shoulder Belt Stowage

Fisher Body reported that all divisions would like to offer a linear retractor for the outboard end of the shoulder belt as an option for all 1969 models. The SRB suggested that this item be limited to selective body styles. Before releasing the linear retractor, the NHTSA must be contacted since there is some question as to whether the retractor meets the existing Federal standard. Fisher Body is to follow up on this item.

6. Sun Visor Outboard Mount

Fisher Body reviewed the new sun visor mounting for the 1969 S-C program.

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7. Head Restraints

Fisher Body reported on the results of their test work to limit rearward head rotation due to rear impact. Based on the results of the test conducted to date on breakaway and tipping seats, the following observations can be stated:

- Adequate reduction in rearward head rotation is not provided.
- Front dummy contacts rear dummy.
- Reduction of driver control capabilities.
- Head rebound with use of shoulder belts may be increased.

A more detailed analysis of the test results will be made by Fisher Body. Fisher Body believes that higher seat backs (26 - 28" should be considered.

Mr. Cole stated that we must consider what trade-offs are involved when evaluating head restraints. We must establish reasonable height of seat backs if we determine that this method provides the desired protection.

Mr. Cole suggested obtaining additional data at higher impact speeds including driver control capabilities. GM should determine at what speeds the head restraint is beneficial and at what speeds it offers very little benefit. Mr. Mitchell emphasized the need to continue to evaluate 26" high seat backs with restraints attached to the seat.

Fisher Body was requested to conduct tests on seats with integrated restraint system. The question was raised as to the possibility of rating injury potential in terms of head rotation.

8. 1968 Vehicle Compliance

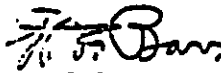
Mr. Parr reviewed with the group the divisional positions on compliance testing of 1968 models. Mr. Warner agreed to check on the identification of the controls on the Chevy II instrument panel.

9. Heated Rear Glass

Mr. Lundstrom reported that he was advised by GM Legal that California will probably approve glass with electric heating provisions. Fisher Body was advised to continue with their development program.

10. Miscellaneous

Mr. Barr reconfirmed with the Safety Review Board that the rocker electric window switch is not to be considered for 1969, and Pontiac will relocate the door locking button to agree with the other car divisions.


H. F. Barr
Vice President

FMC/js

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