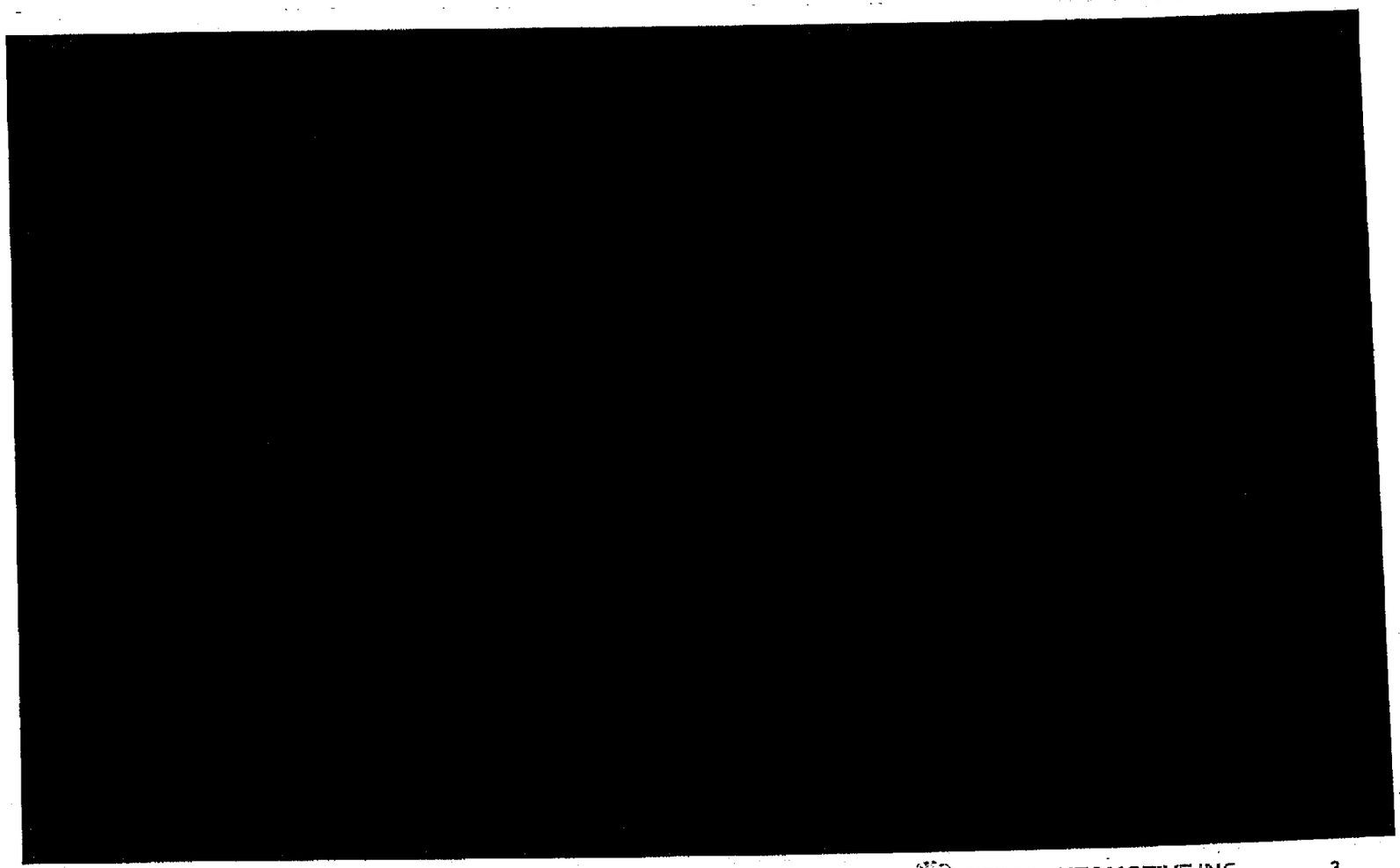
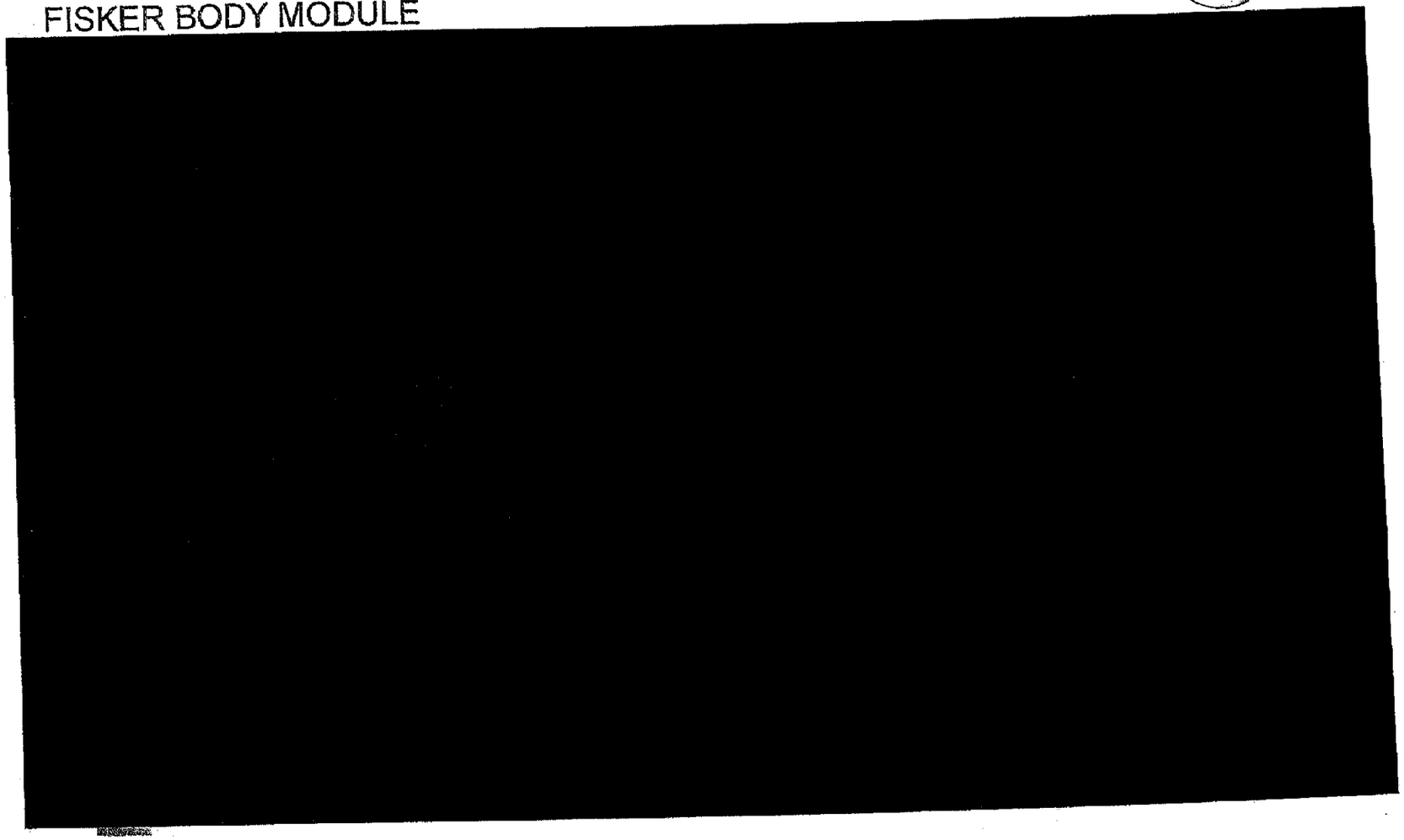
SPACEFRAME

FISKER BODY MODULE



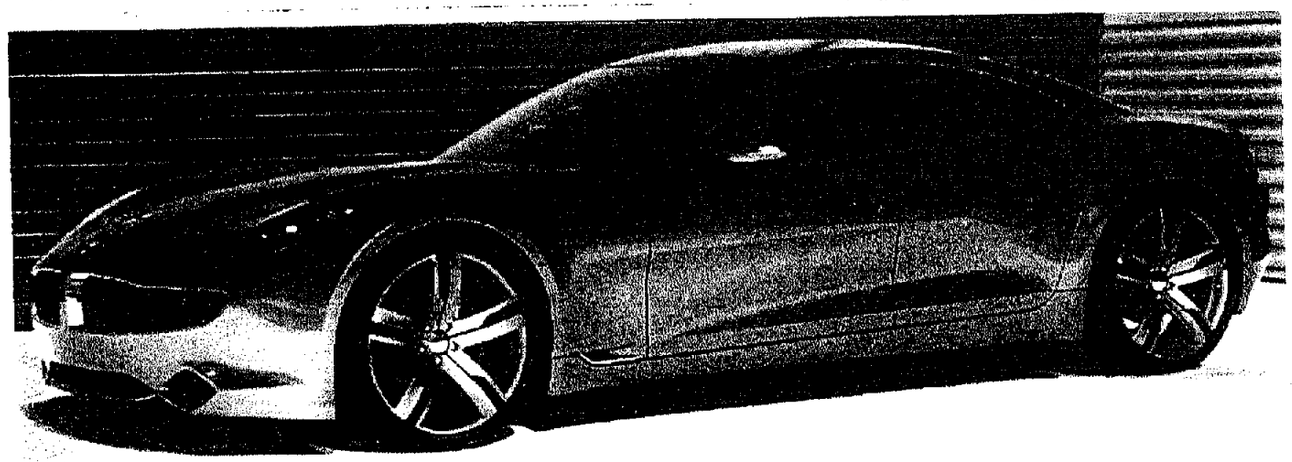
SPACEFRAME - SAFETY

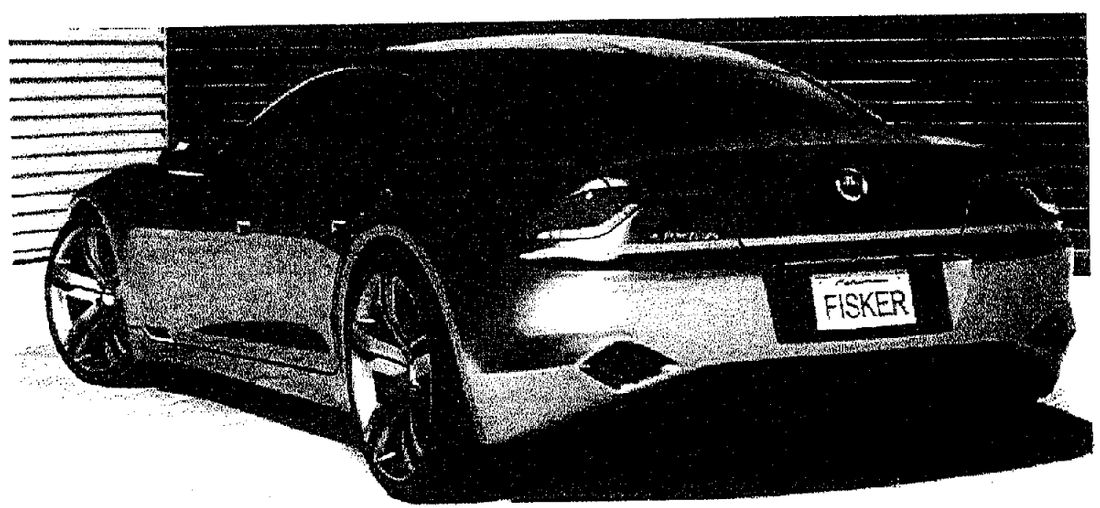
FISKER BODY MODULE



EXTERIOR - STYLING

FISKER BODY MODULE

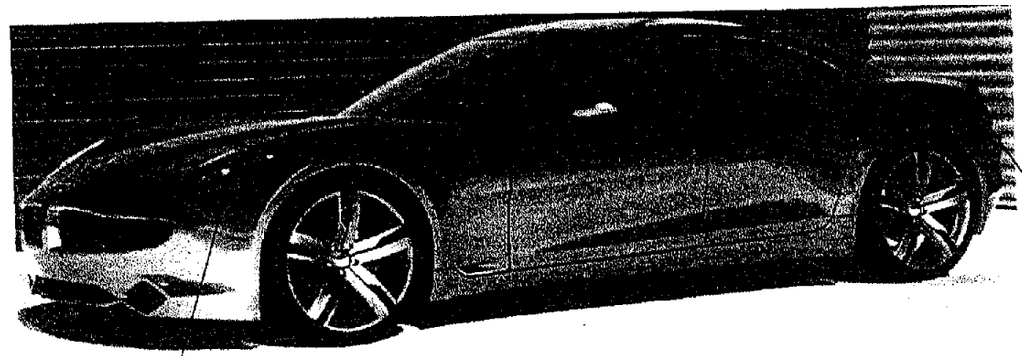


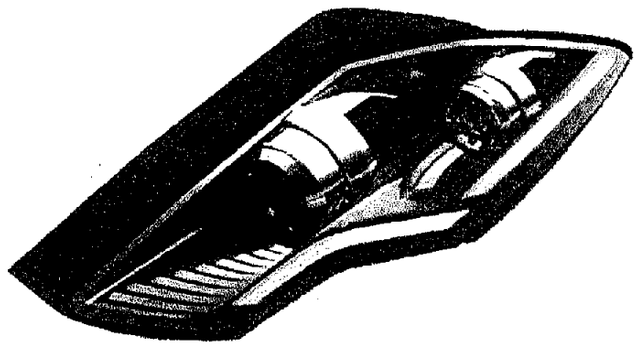


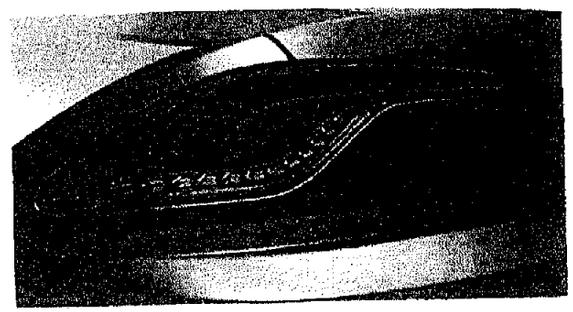
EXTERIOR - LIGHTING

FISKER BODY MODULE

[redacted]

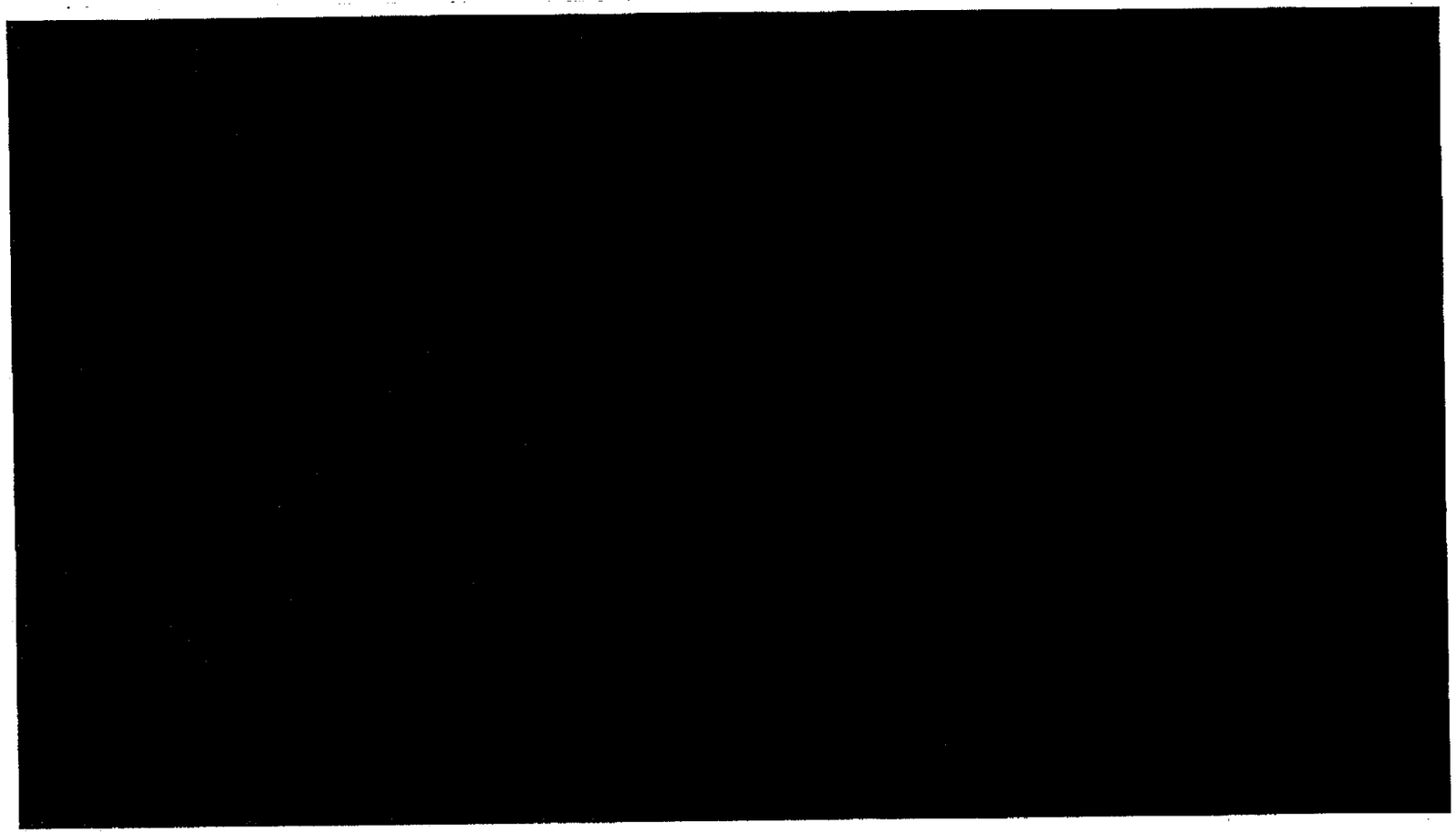






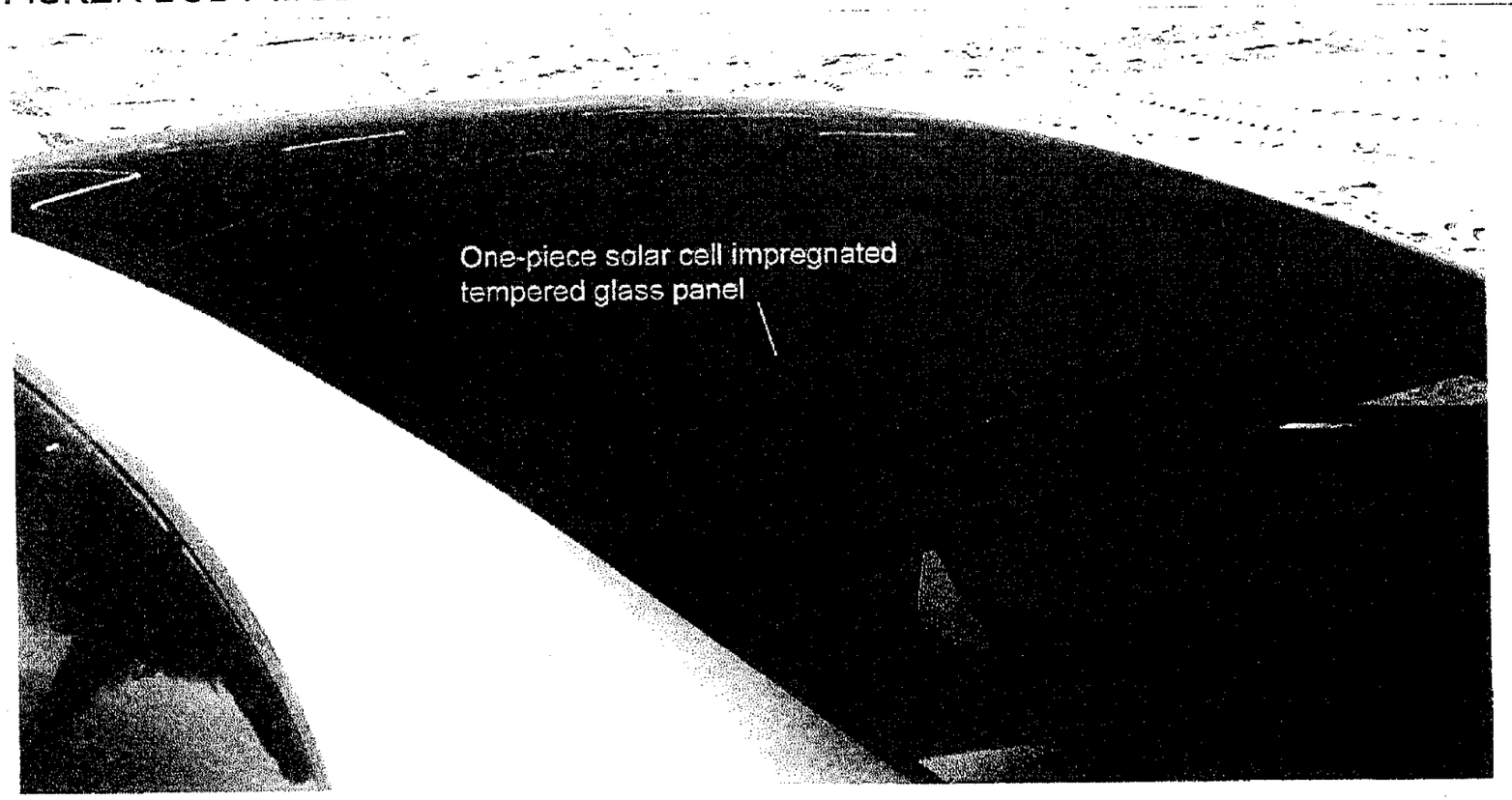
BODY PANELS

FISKER BODY MODULE



SOLAR ROOF

FISKER BODY MODULE



The one-piece full-length roof glass of the Karma holds an innovative solar powered roof. The solar roof is a laminate of automotive tempered glass and solar cells beautifully designed under a pattern that highlights the solar cells functionality.

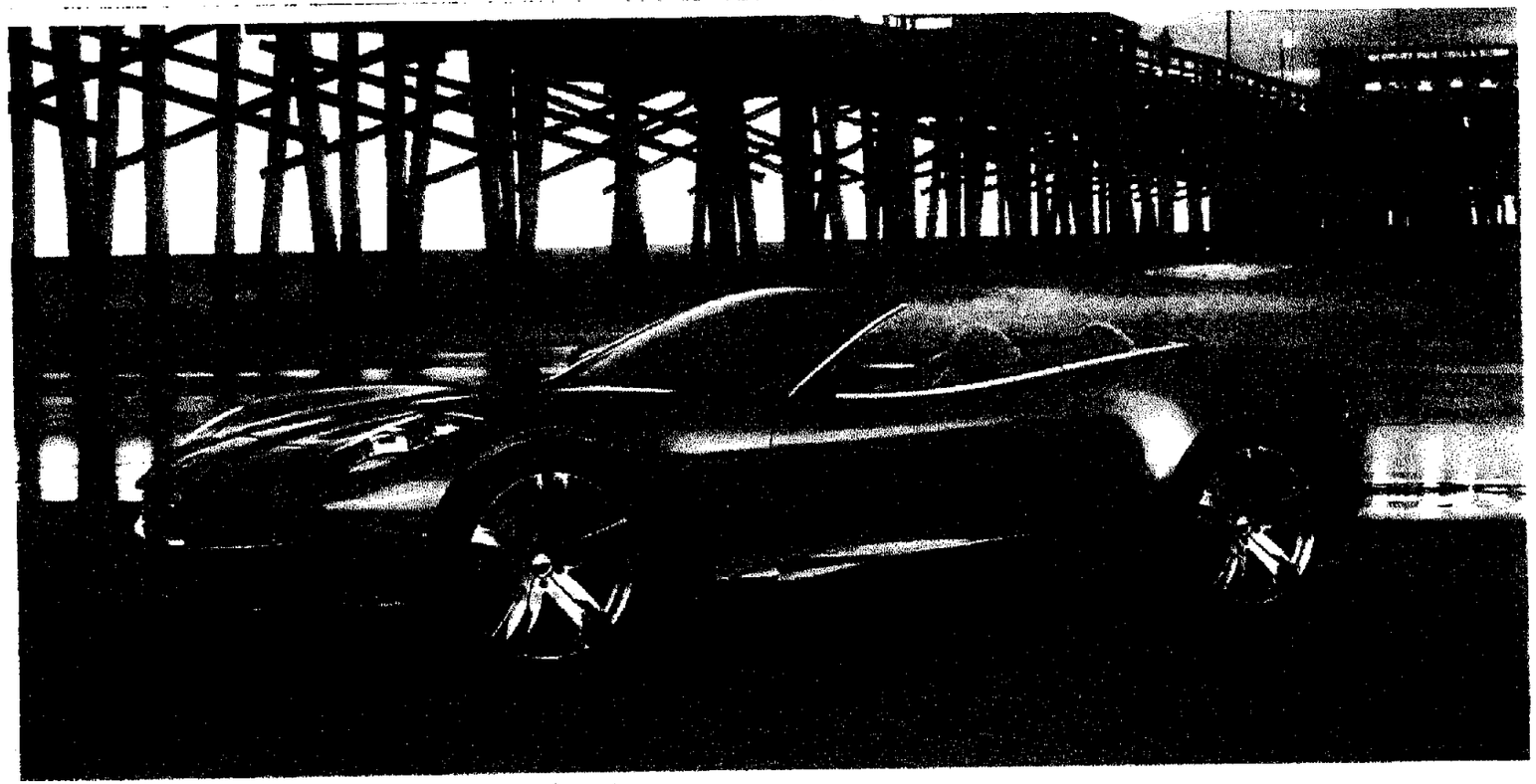
AERODYNAMICS

FISKER BODY MODULE

[redacted]

FISKER BODY MODULE

CONVERTIBLE

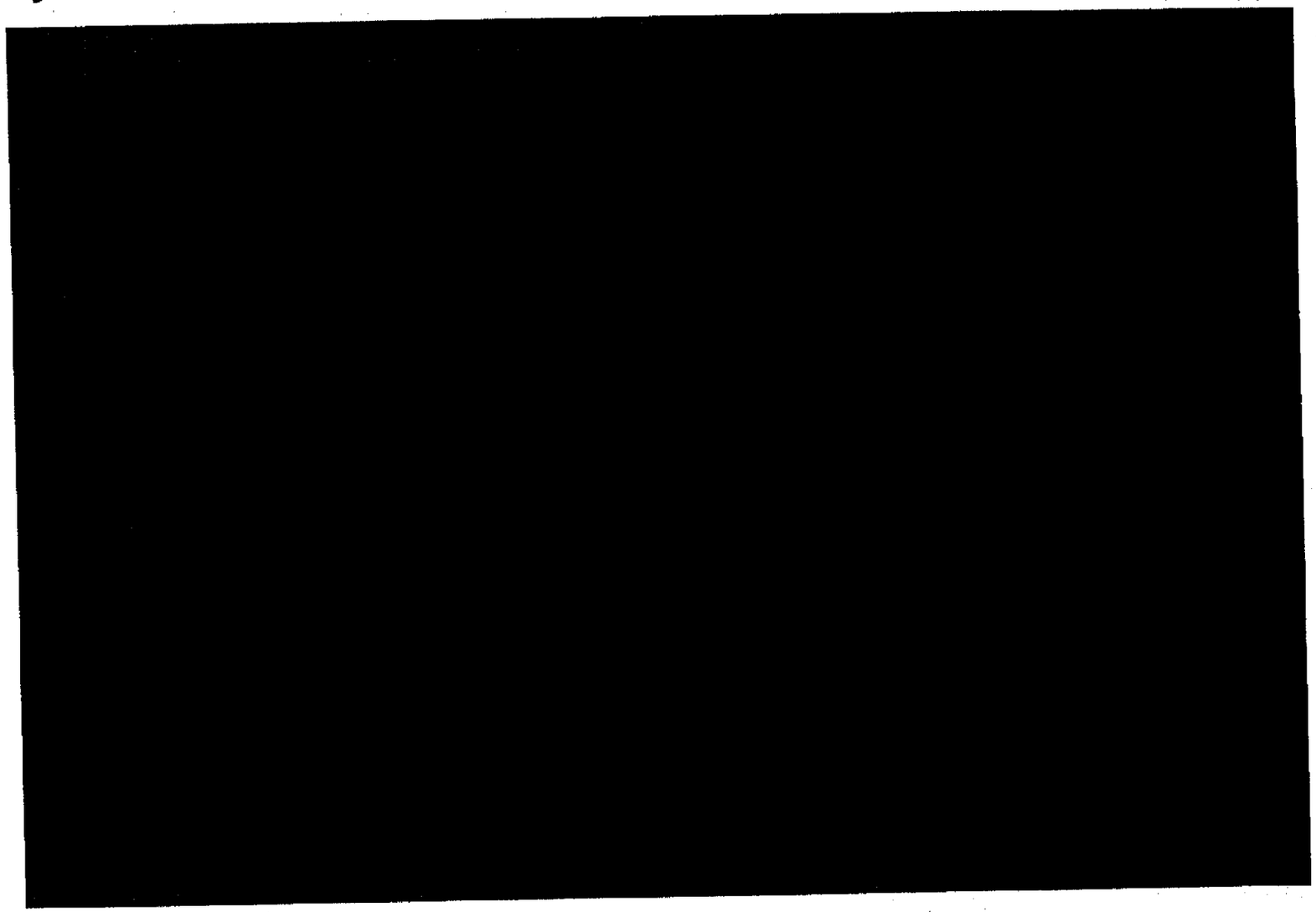


The Fisker Karma Convertible, known internally as the K2, at the Newport Beach Pier (virtually rendered). The convertible features a two-piece retractable hard top for the ultimate in open air motoring.

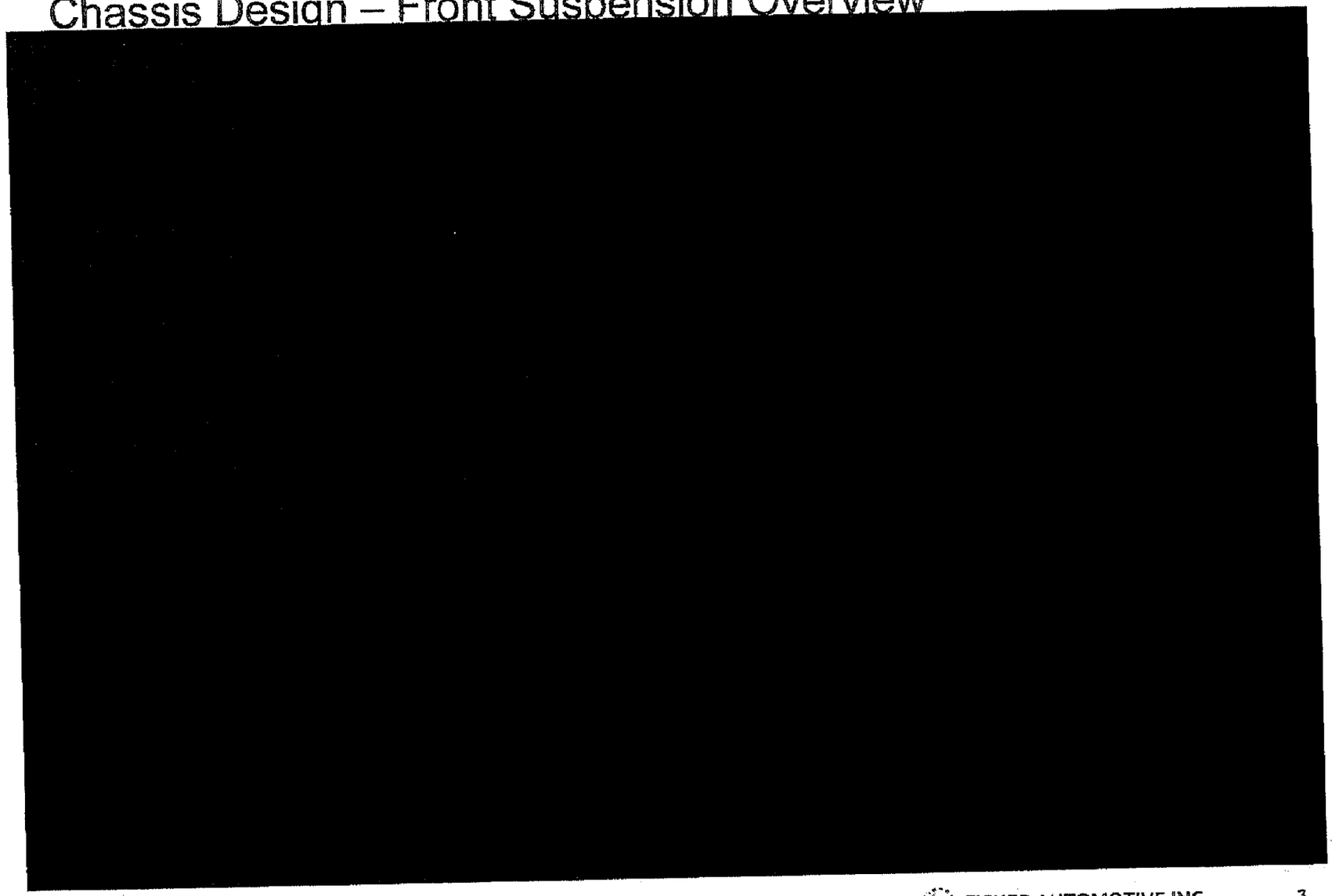
Chassis - Suspension, Steering, and Brakes

Chassis Design Summary

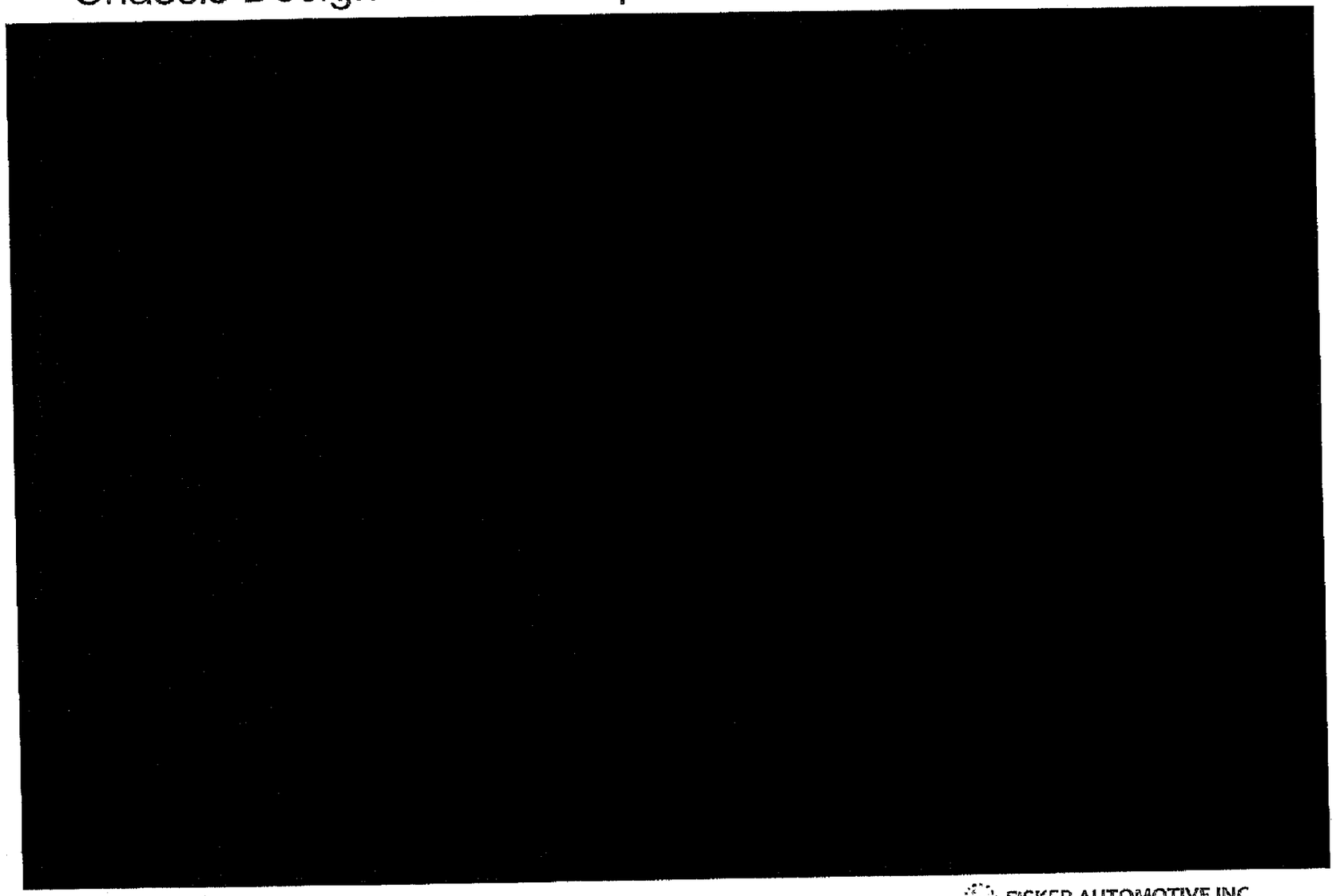
Key Chassis Component Suppliers



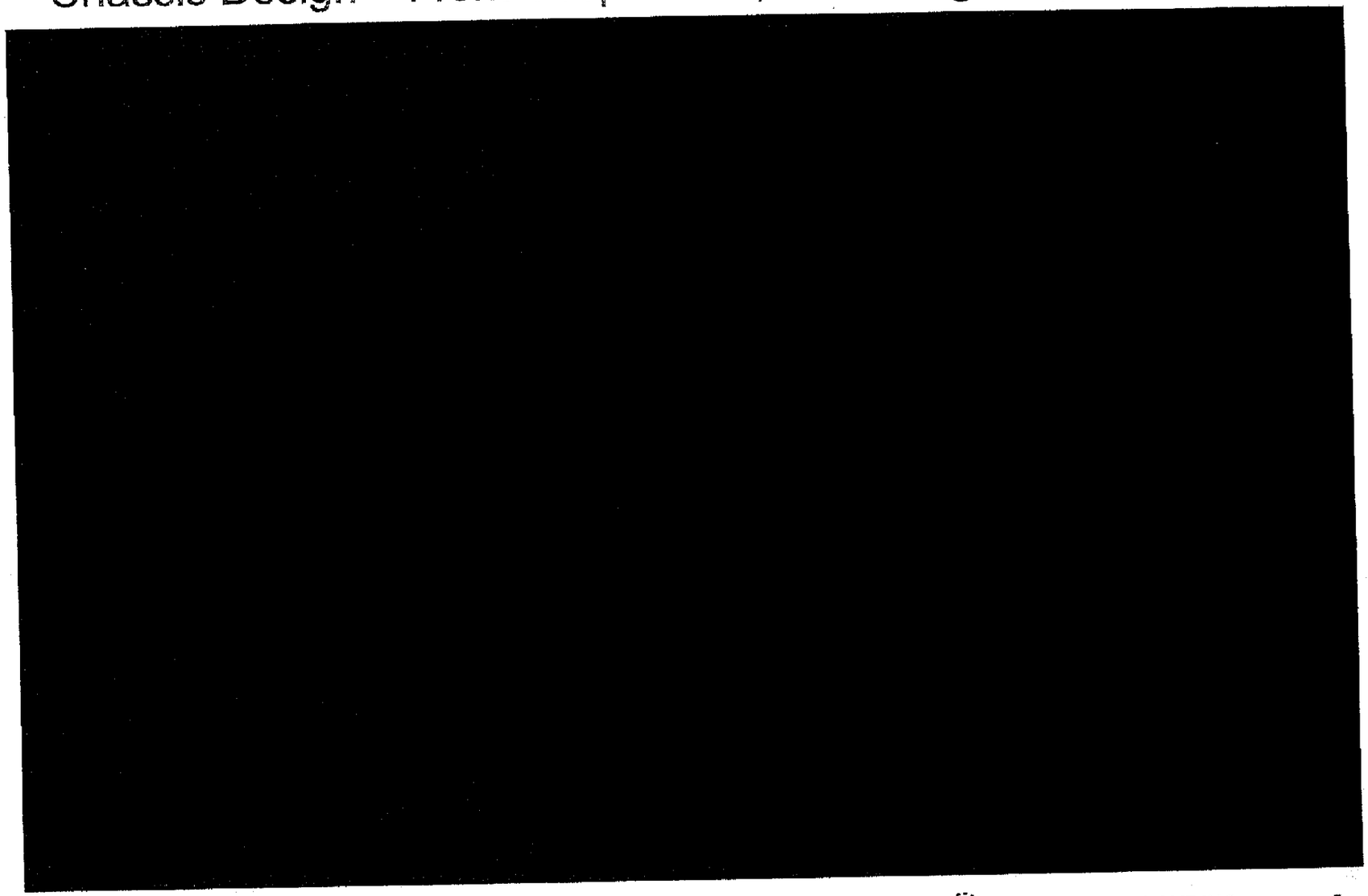
Chassis Design – Front Suspension Overview



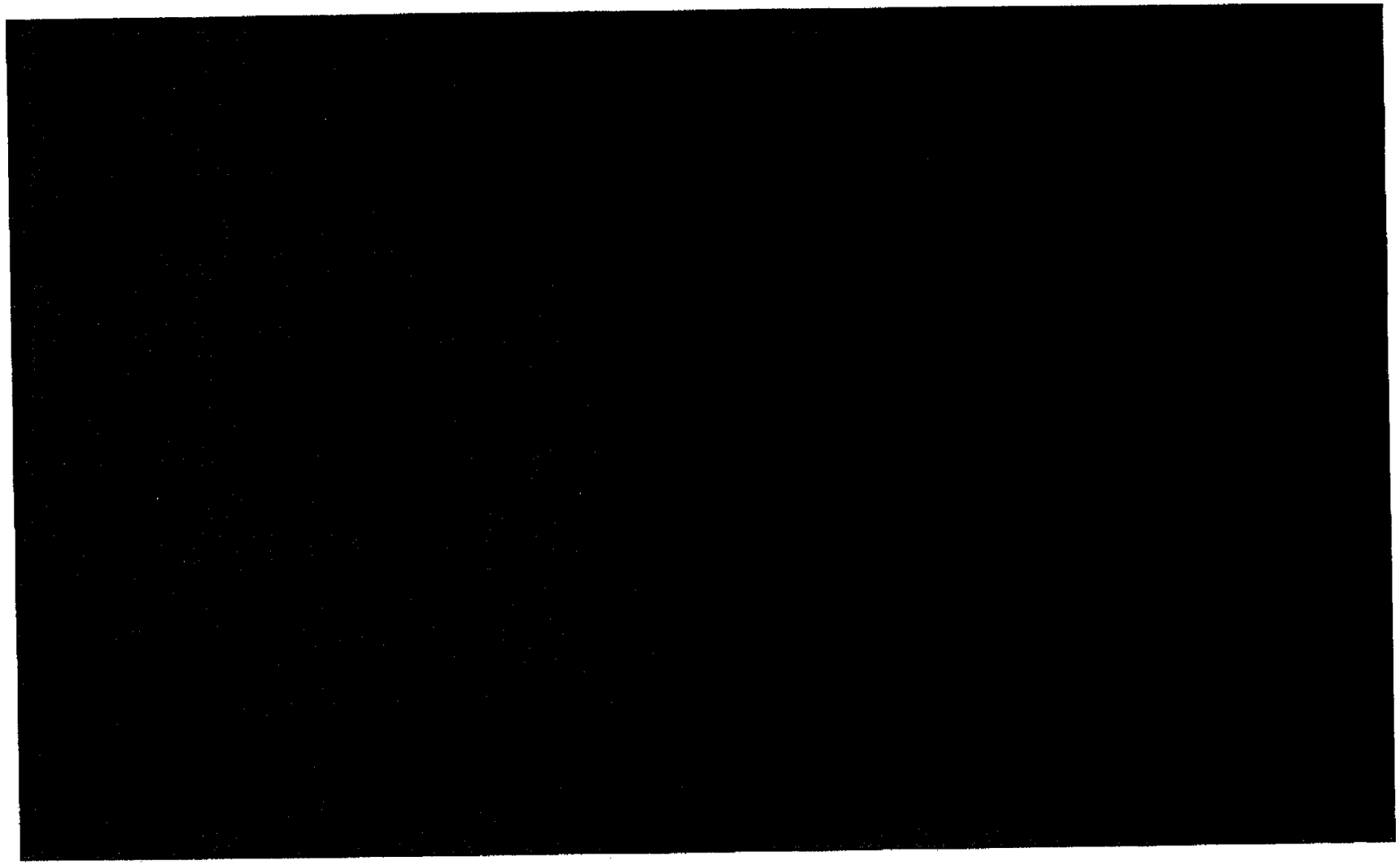
Chassis Design – Front Suspension Overview



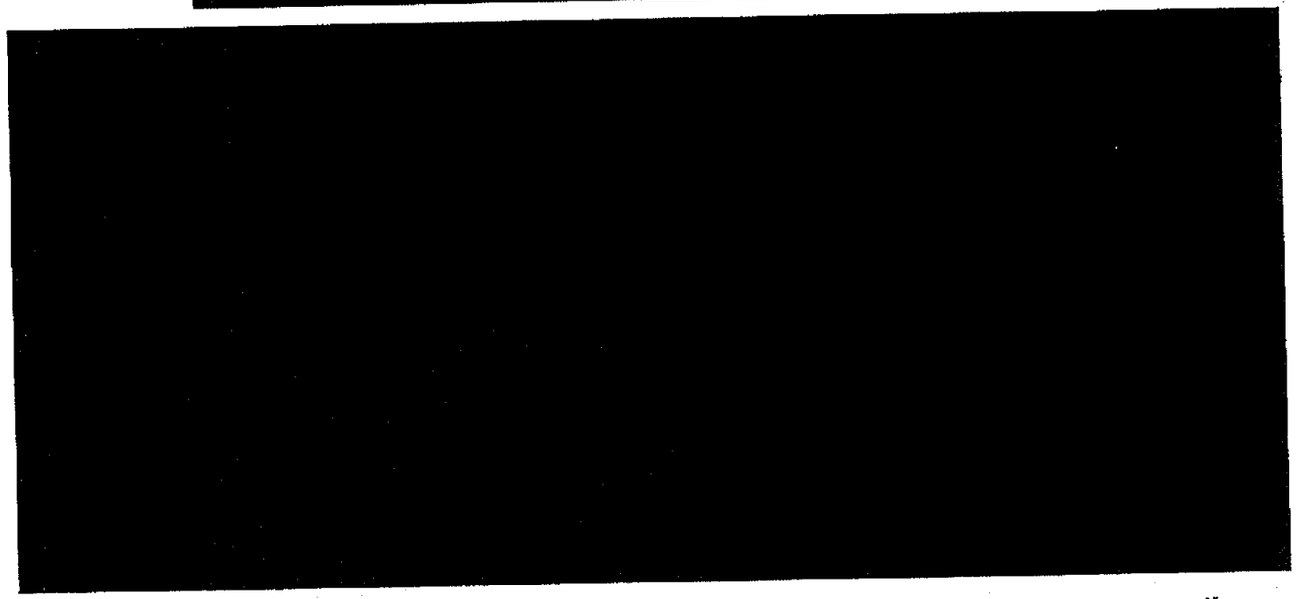
Chassis Design – Front Suspension, Ride Height Optimization



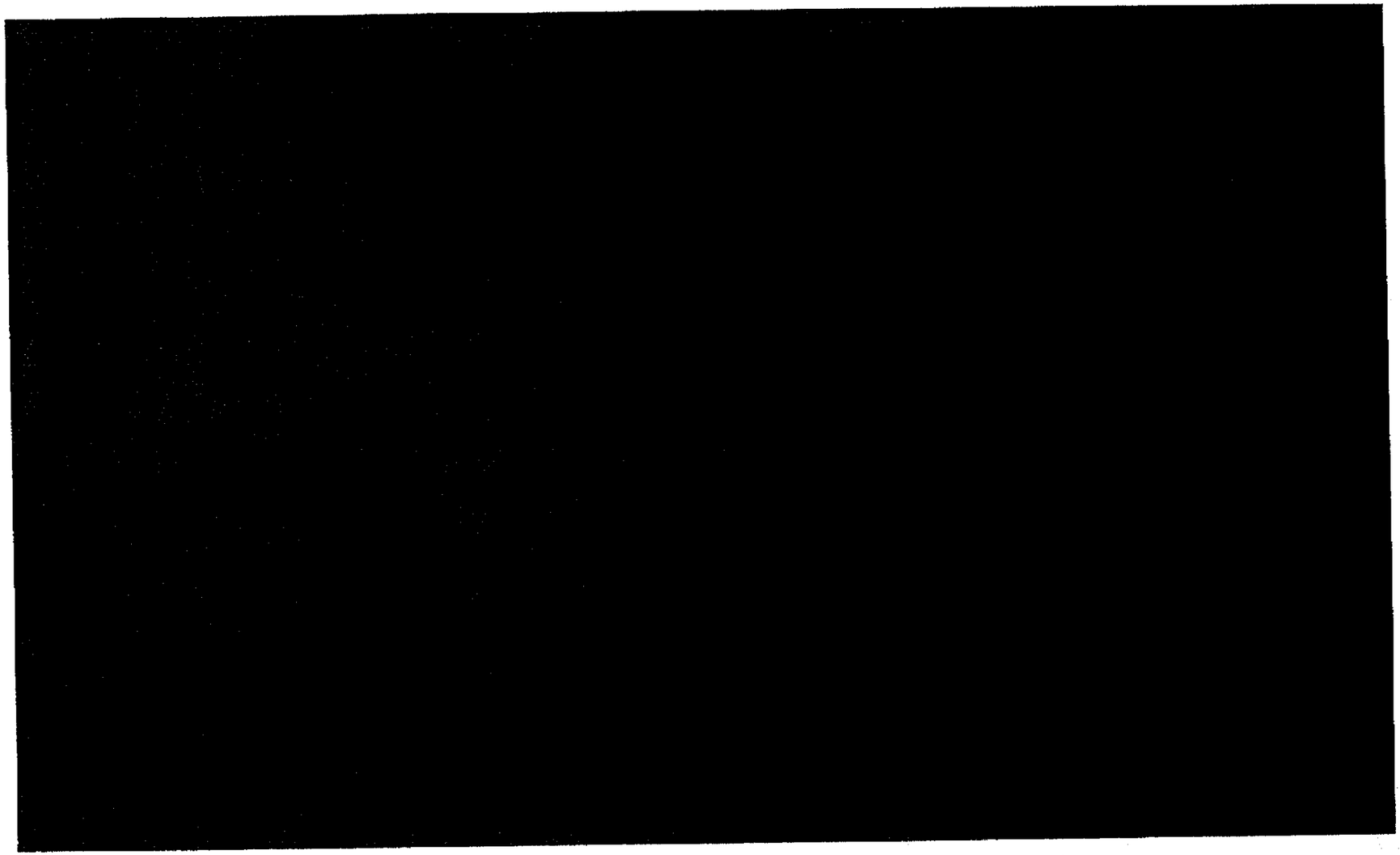
Chassis Design – Front Suspension, Bushing Optimization



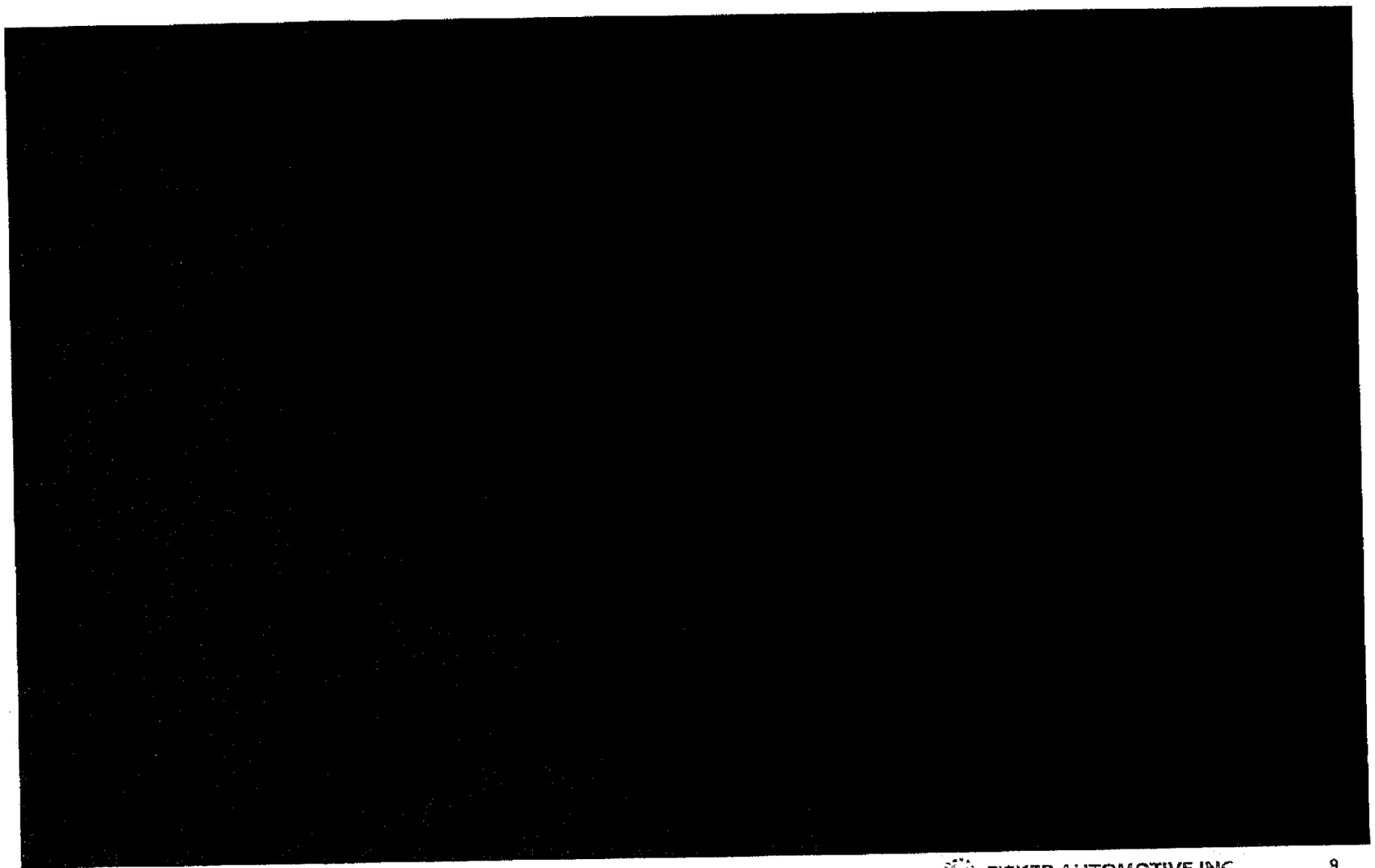
Chassis Design – Peak Load Component Magnitudes



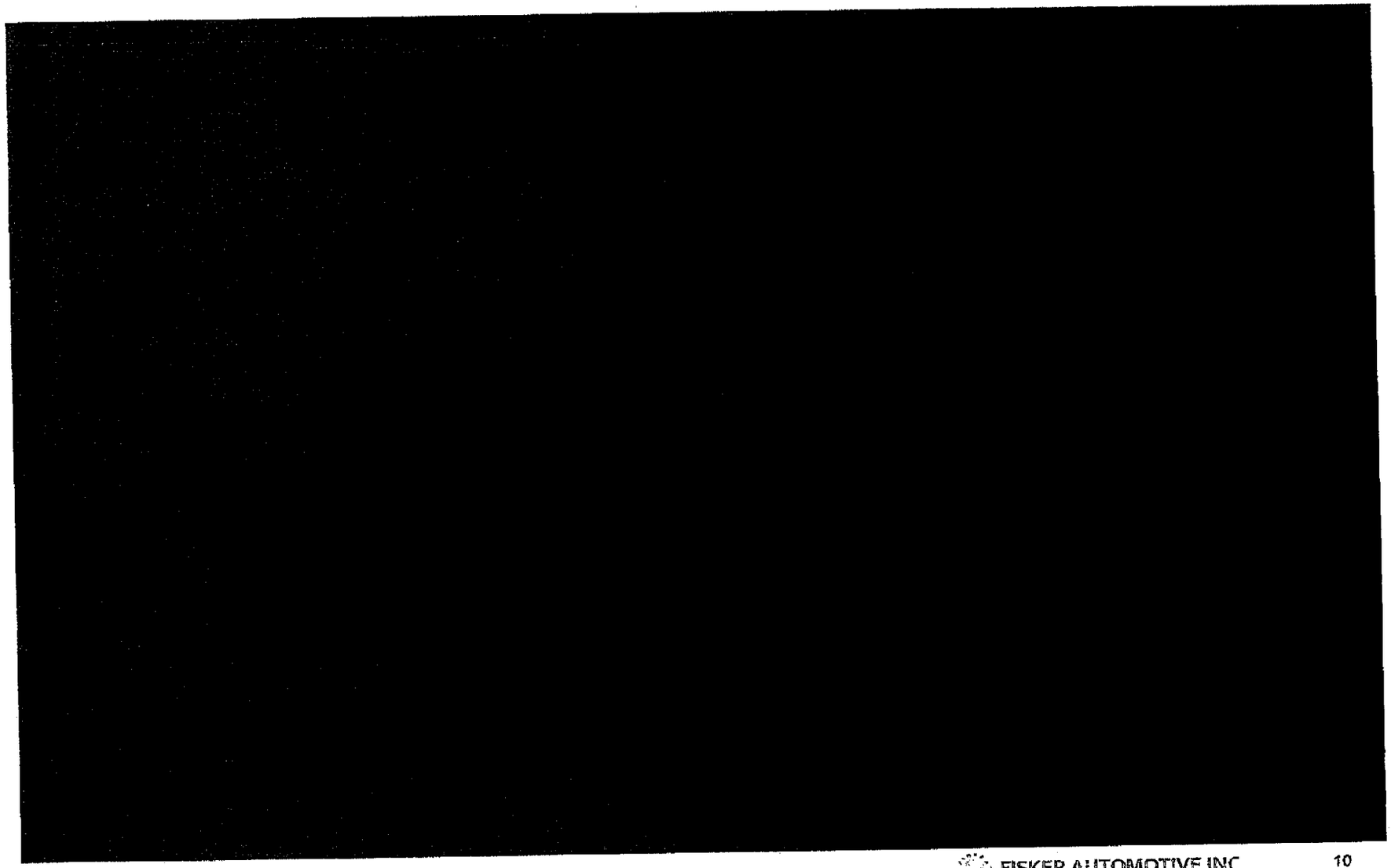
Chassis Design – Steering & Brake Pedal



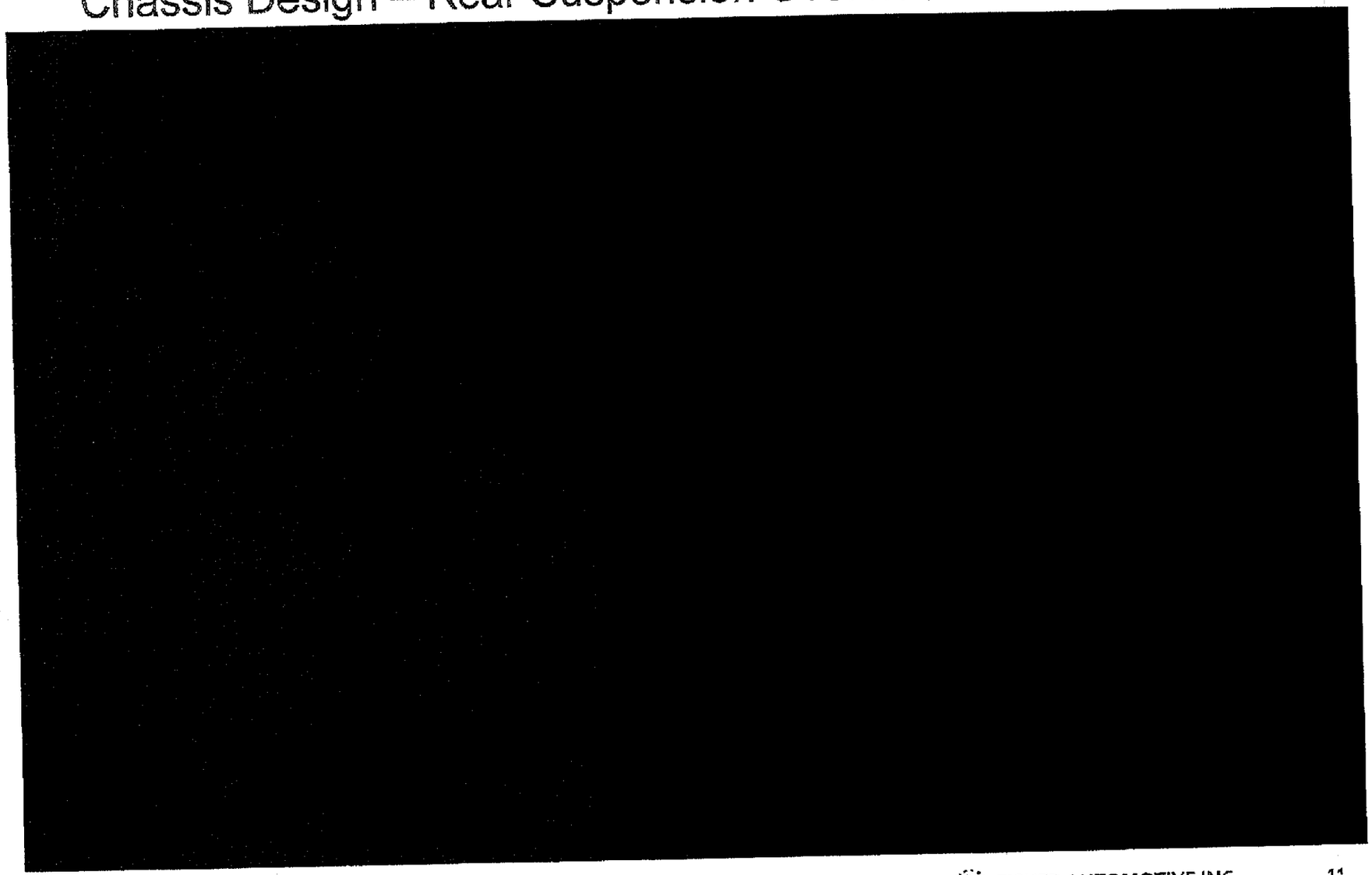
Chassis Design – Electro-Hydraulic Power Steering (EHPS)



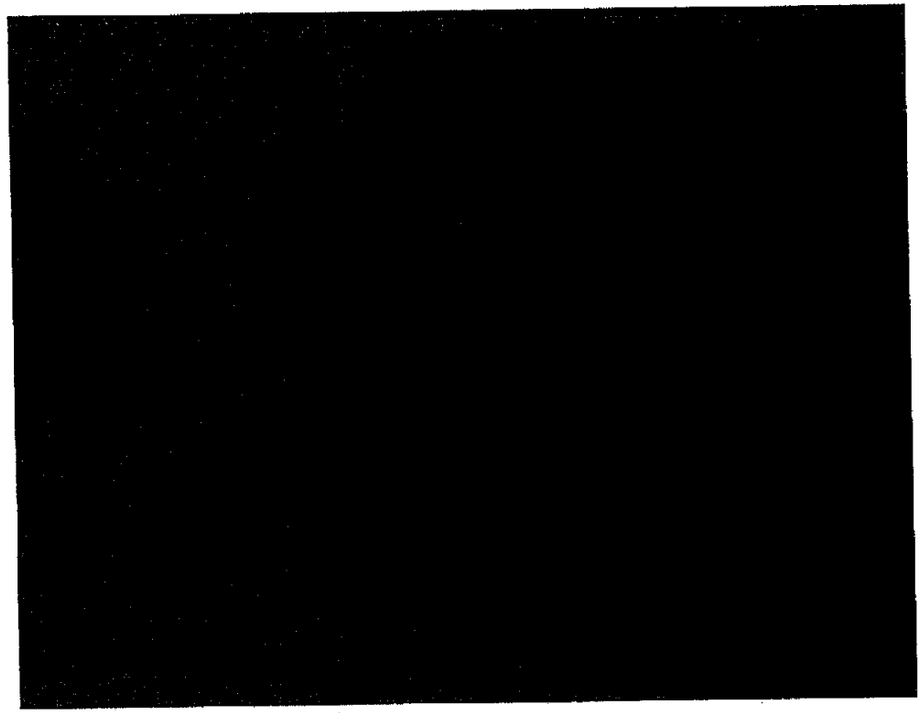
Chassis Design – Key Brake System Components

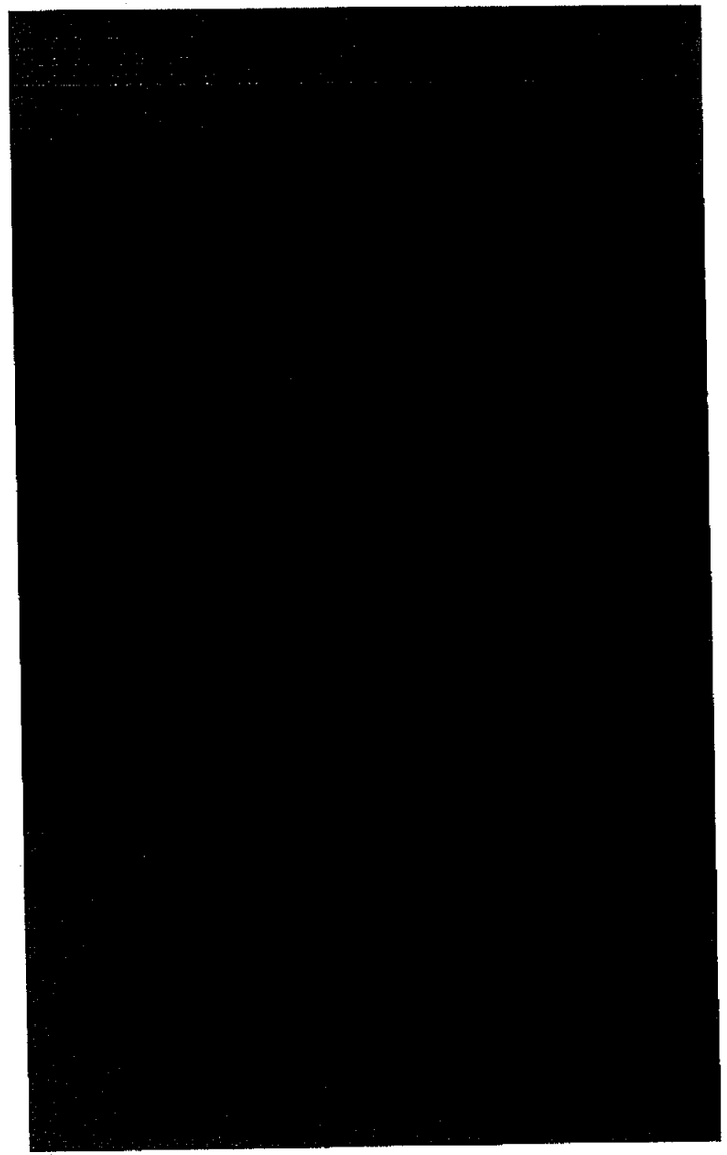


Chassis Design – Rear Suspension Overview

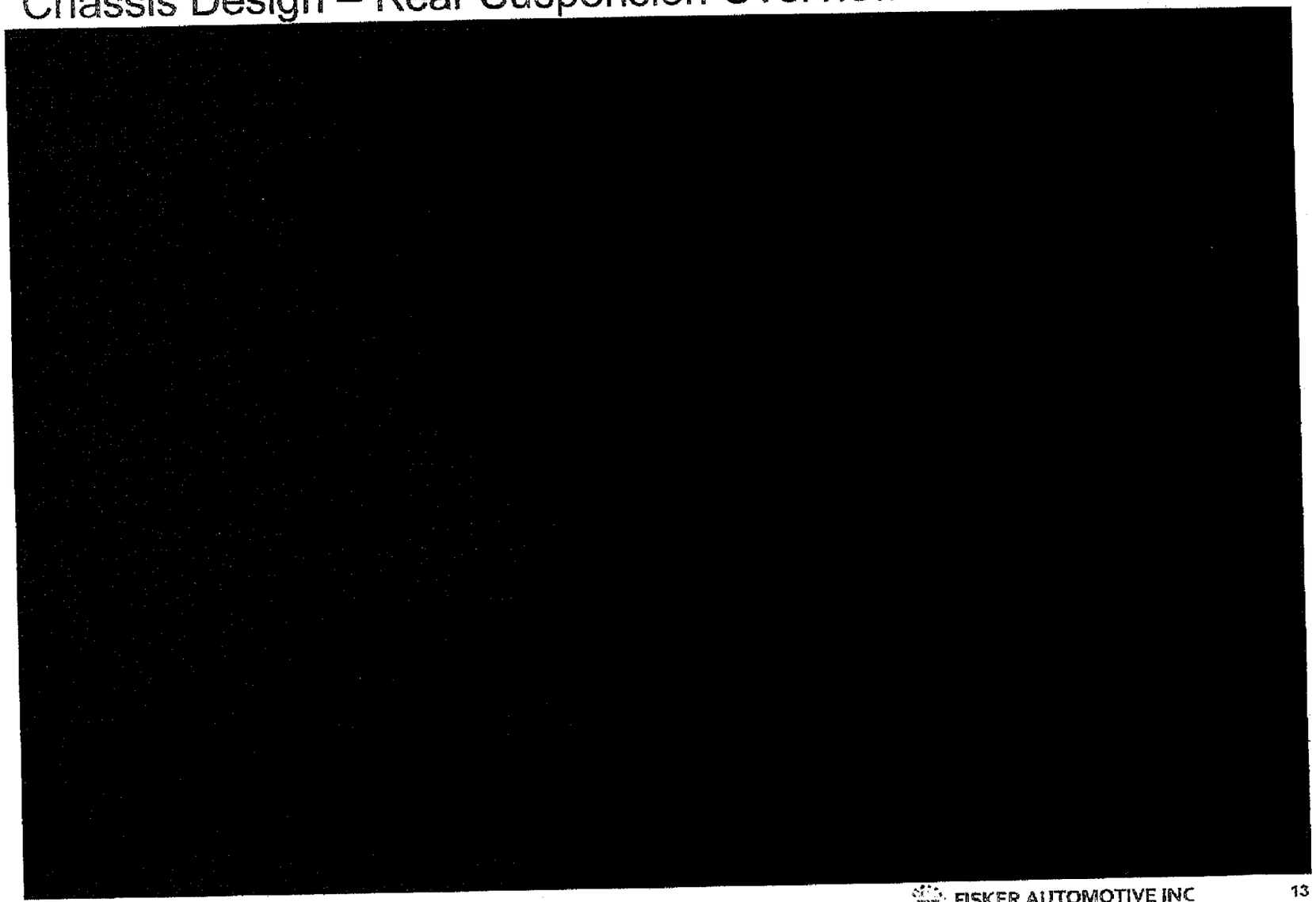


C2 CAD Drawings – Parking Brake

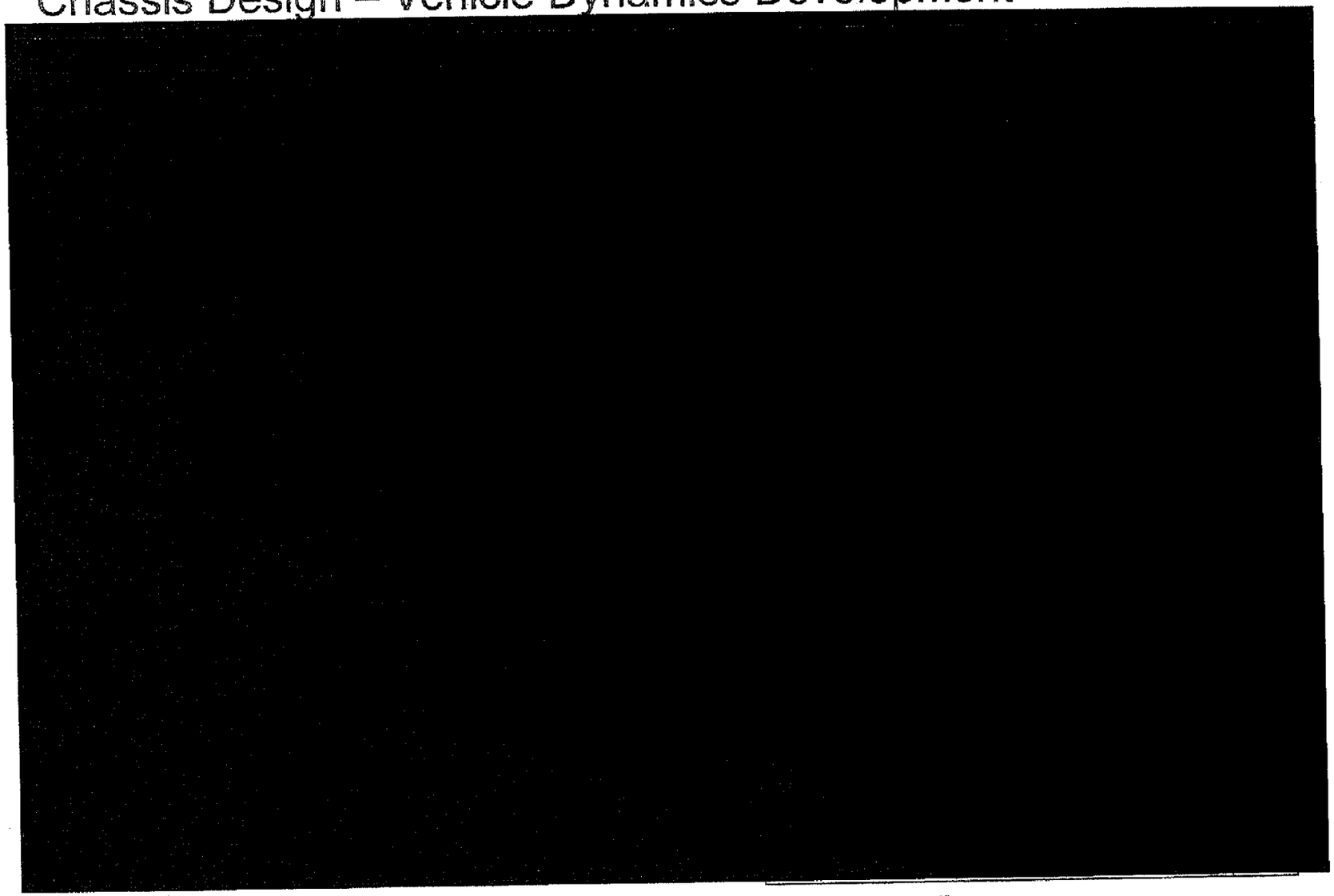




Chassis Design – Rear Suspension Overview



Chassis Design – Vehicle Dynamics Development



Specifications

Front Suspension

[redacted]

Rear Suspension

[redacted]

Steering System

[redacted]

Specifications, cont.

Foundation Brakes
- Front calipers: [redacted]
- Front rotors:
- Rear calipers:
- Rear rotors:

Brake Actuation System

[redacted]

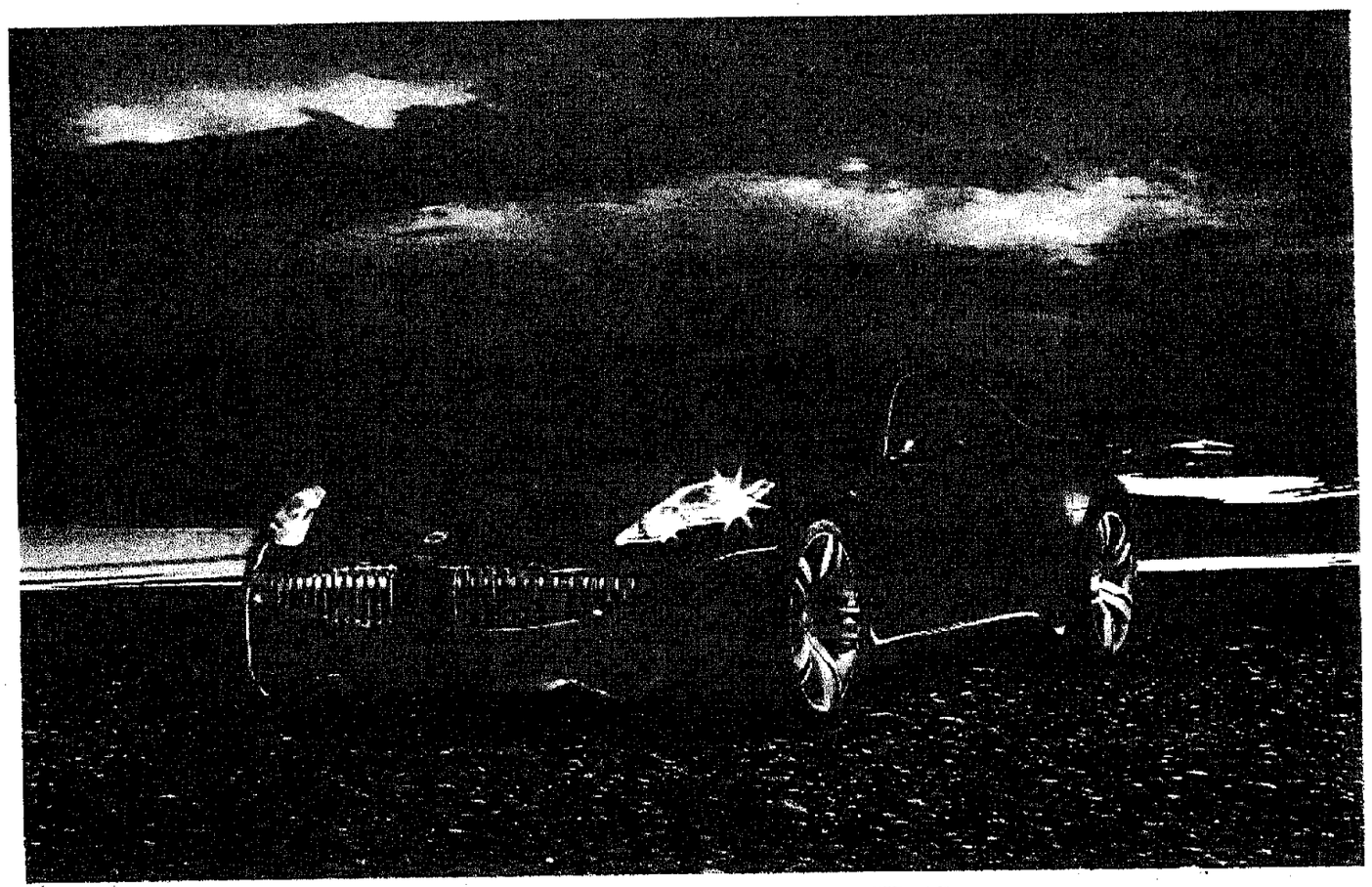
Parking Brake

[redacted]

Tires
- Front: [redacted]
- Rear:

Wheels
- Front: [redacted]
- Rear:

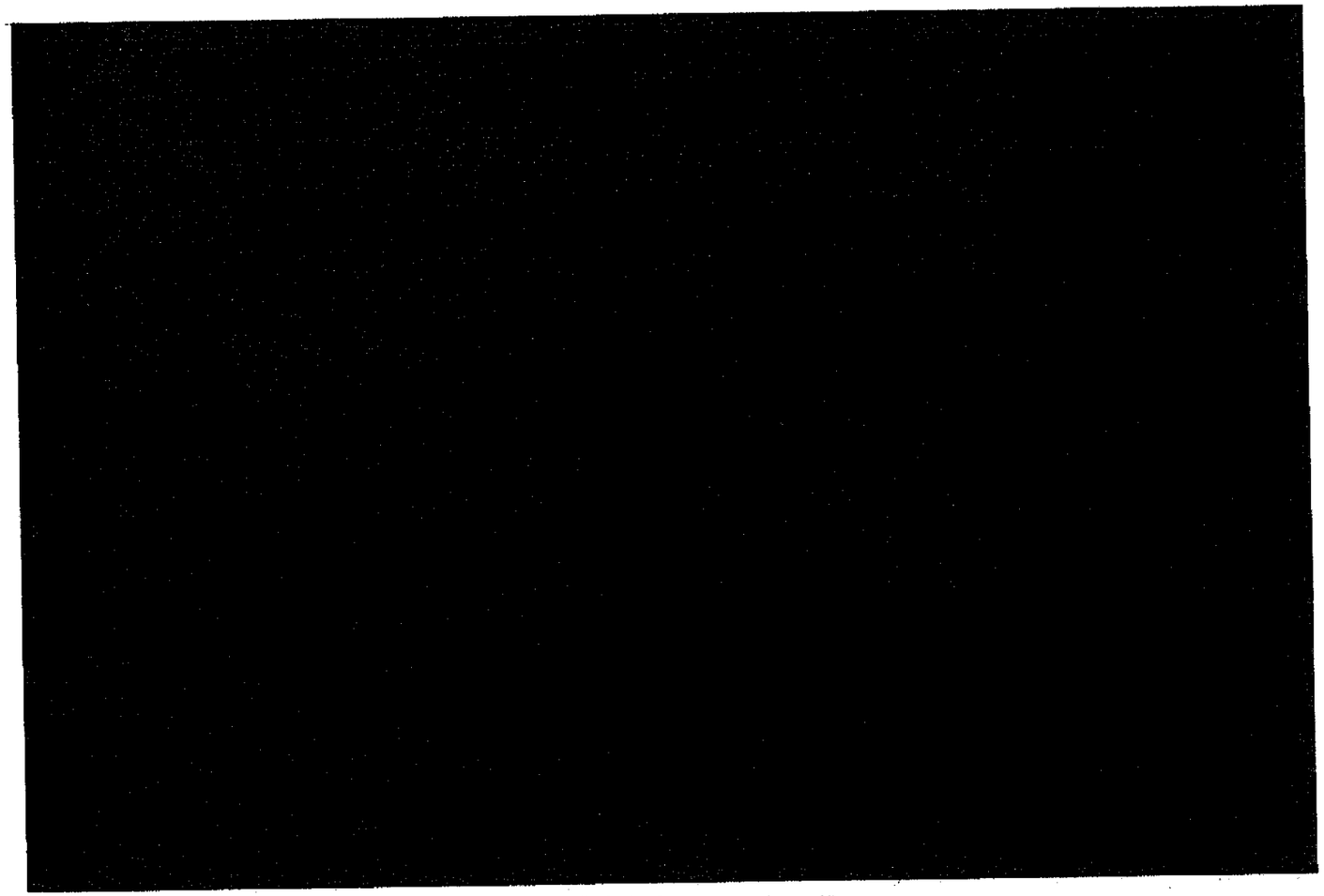
FISKER INTERIOR MODULE



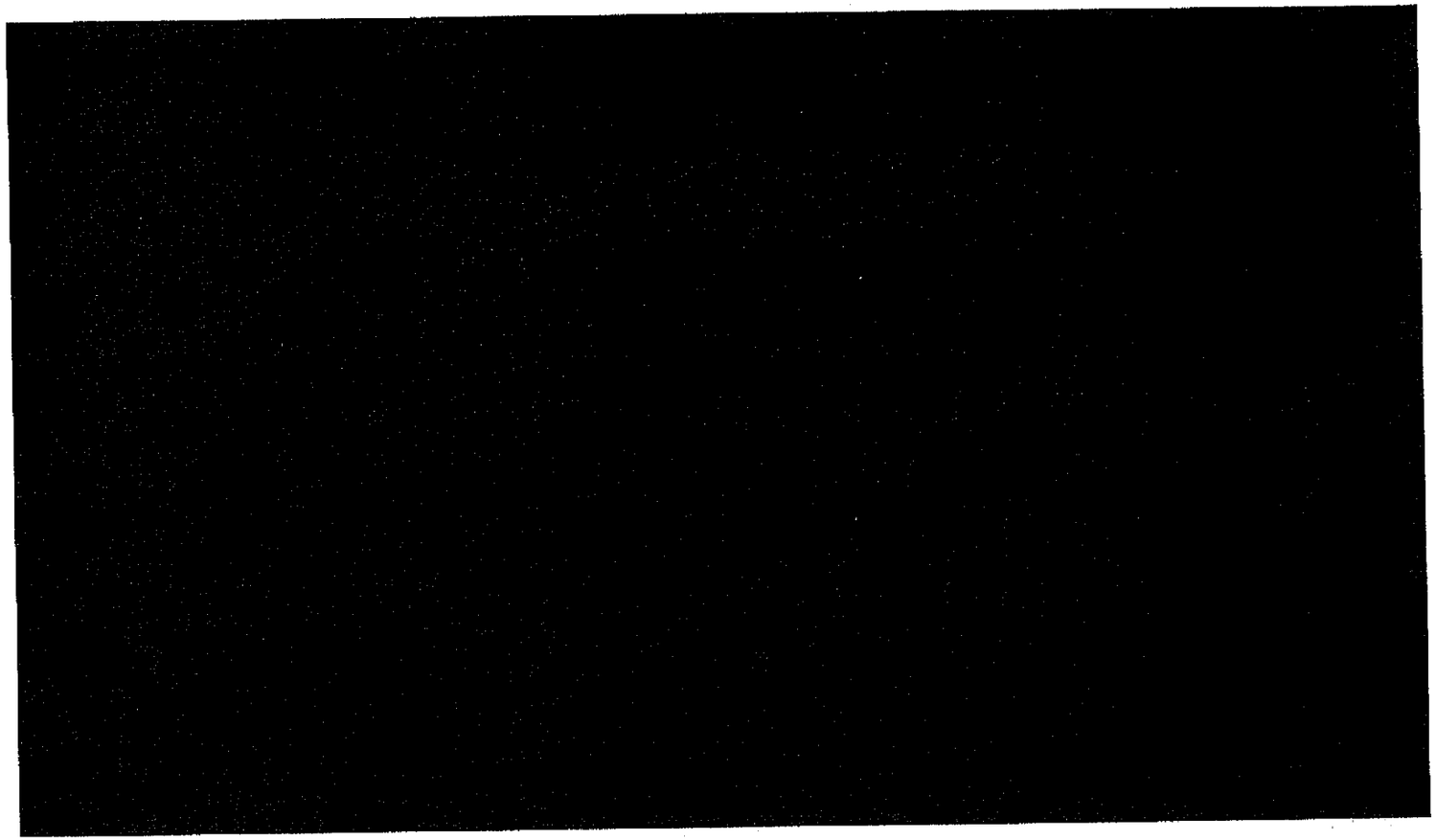
INTERIOR COCKPIT

- INSTRUMENT PANEL
- CONSOLE
- SEATING DOOR TRIM
- THERMAL MANAGEMENT
- SAFTEY AND RESTRAINTS

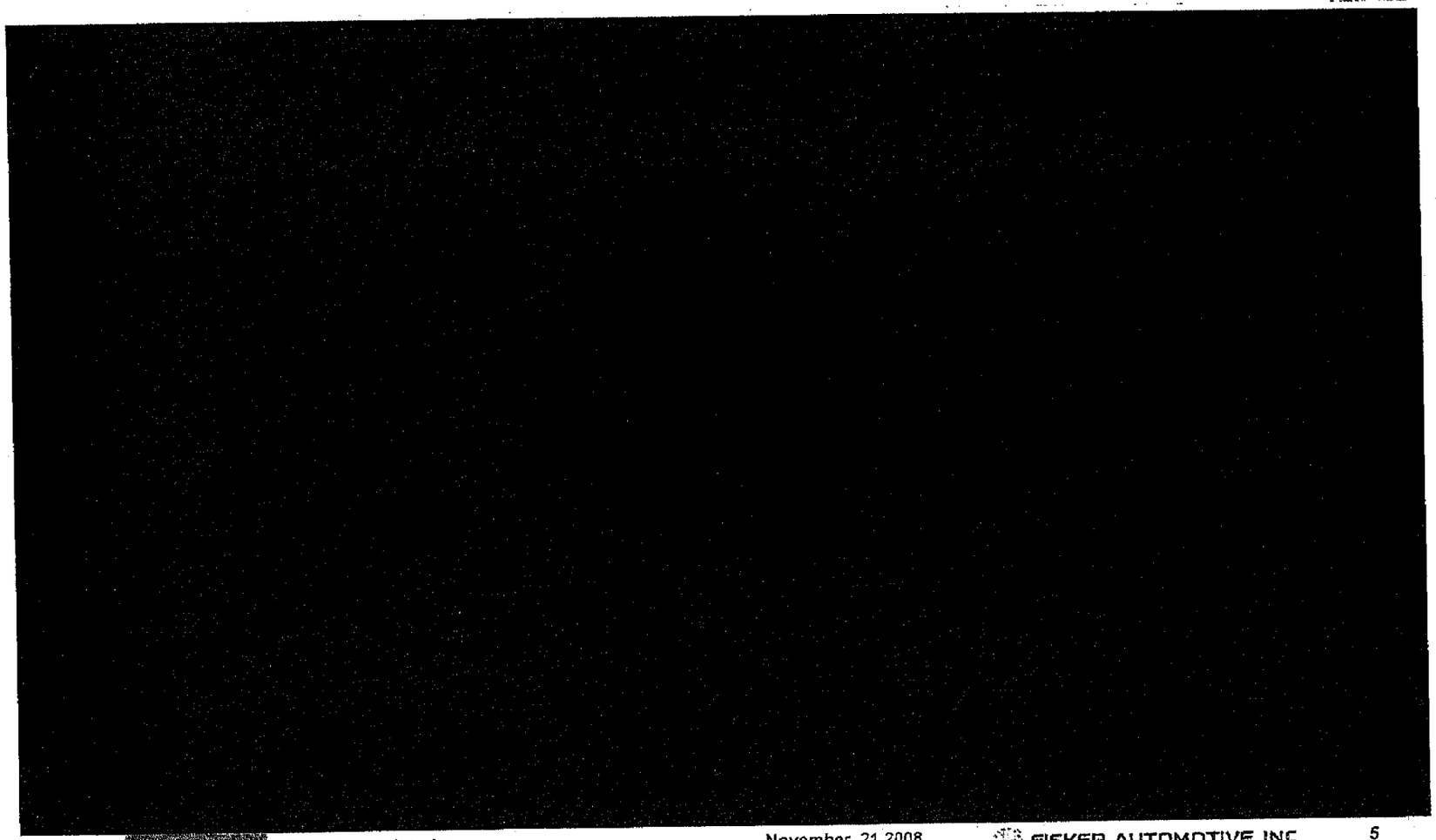
INTERIOR FEATURES



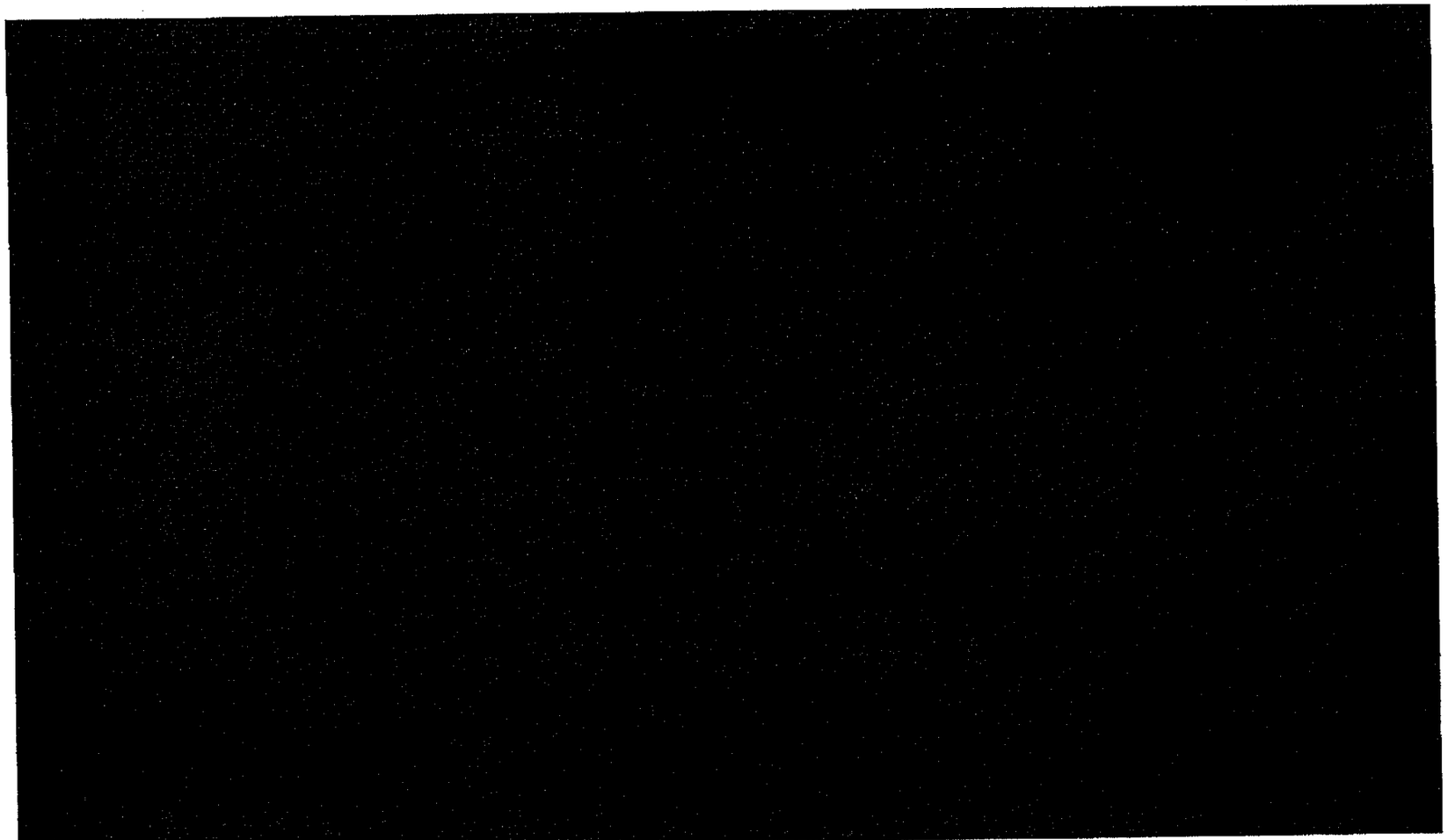
INSTRUMENT PANEL FEATURES



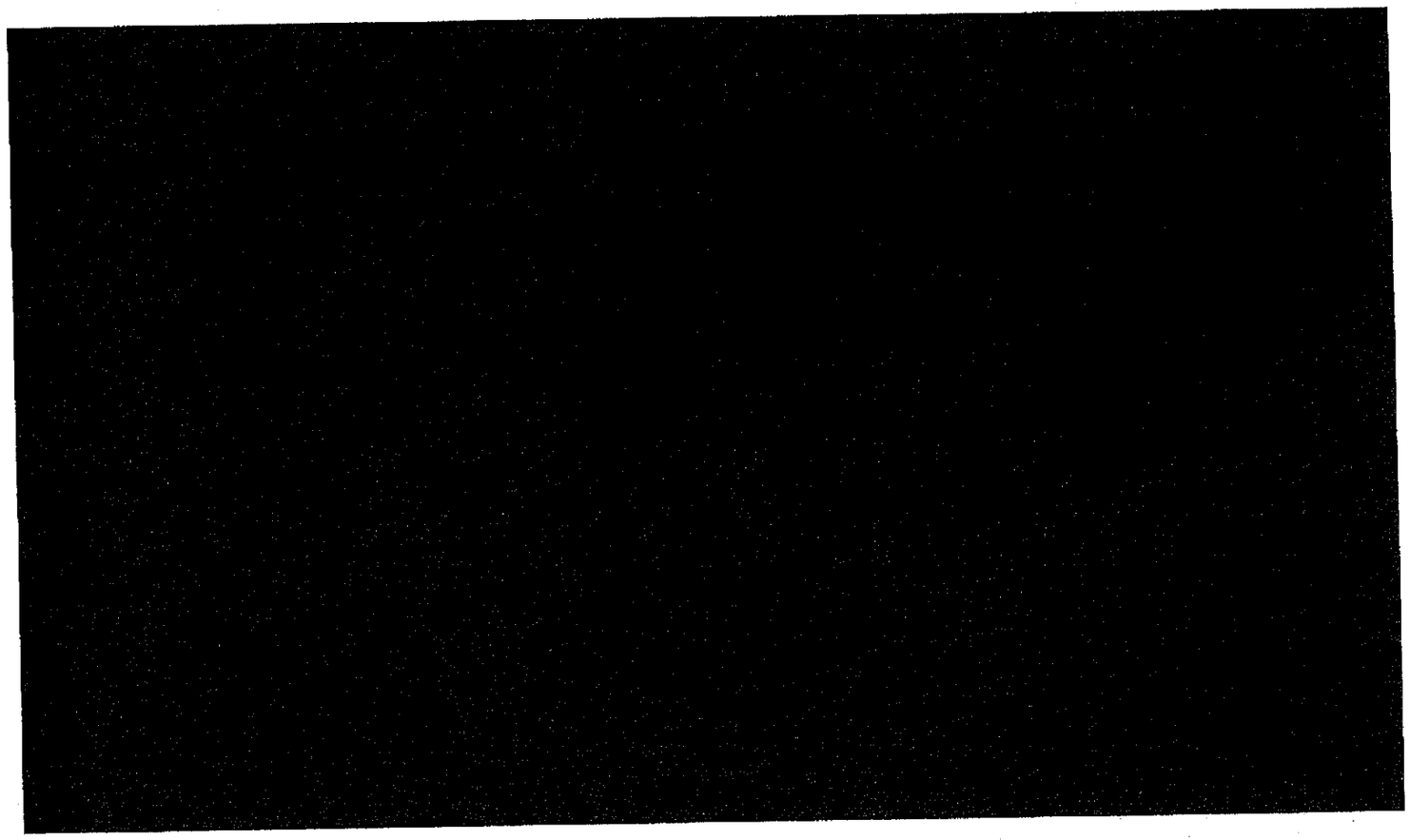
FLOOR CONSOLE (CONTINOUS FRONT TO REAR) FEATURES



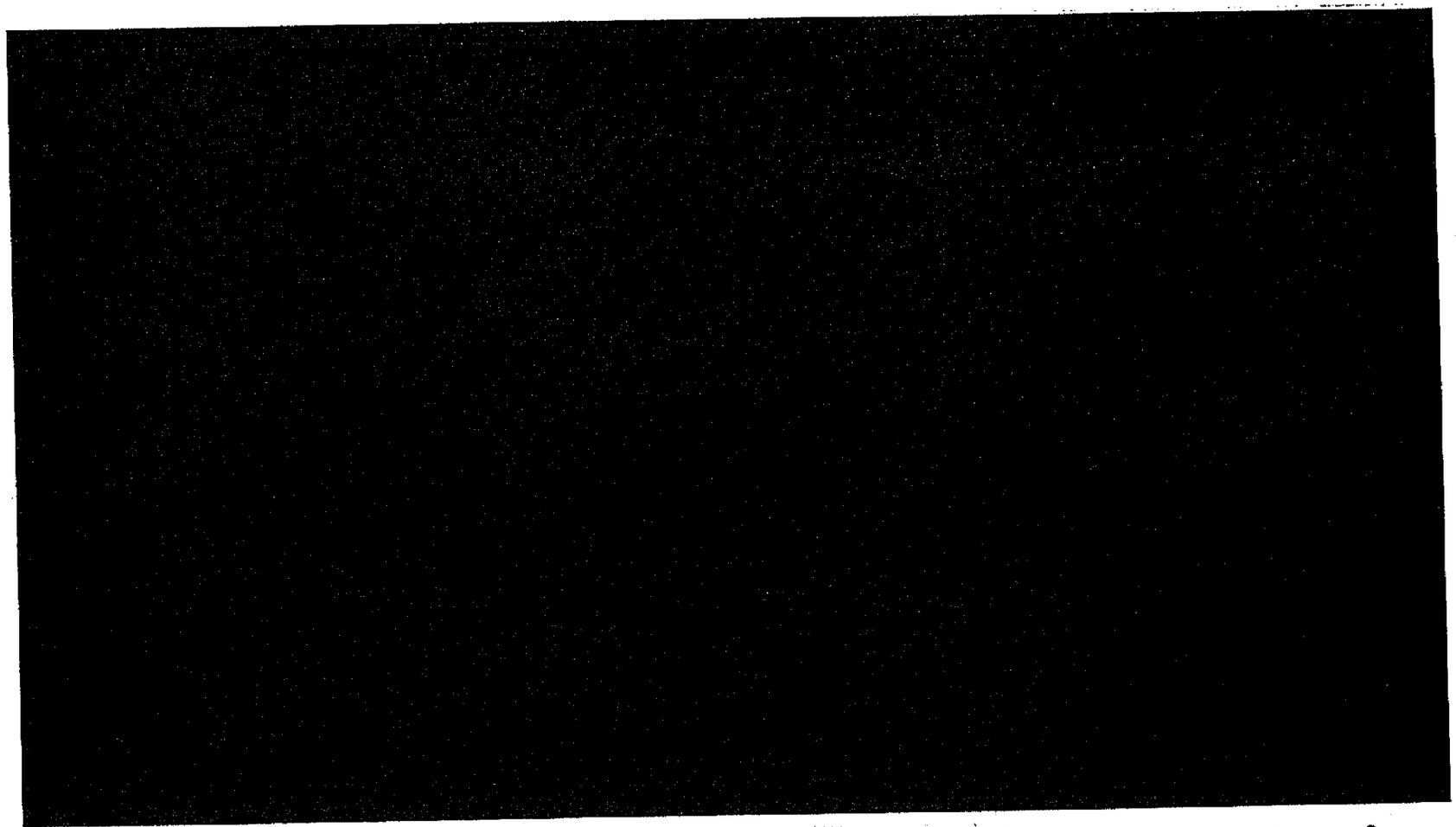
LAMINATED GLASS CAPACITIVE TOUCH SENSOR



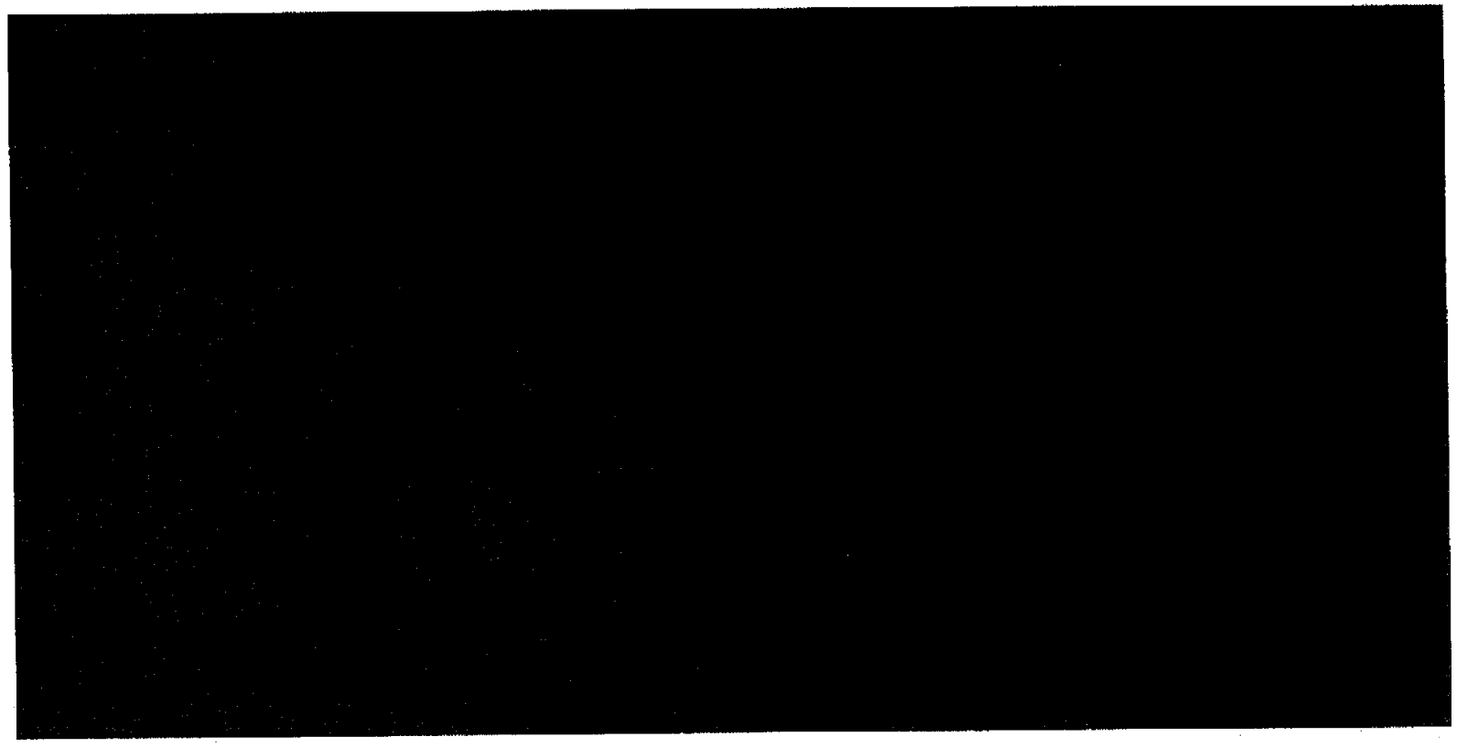
FRONT SEAT OCCOUPANT COMFORT FEATURES



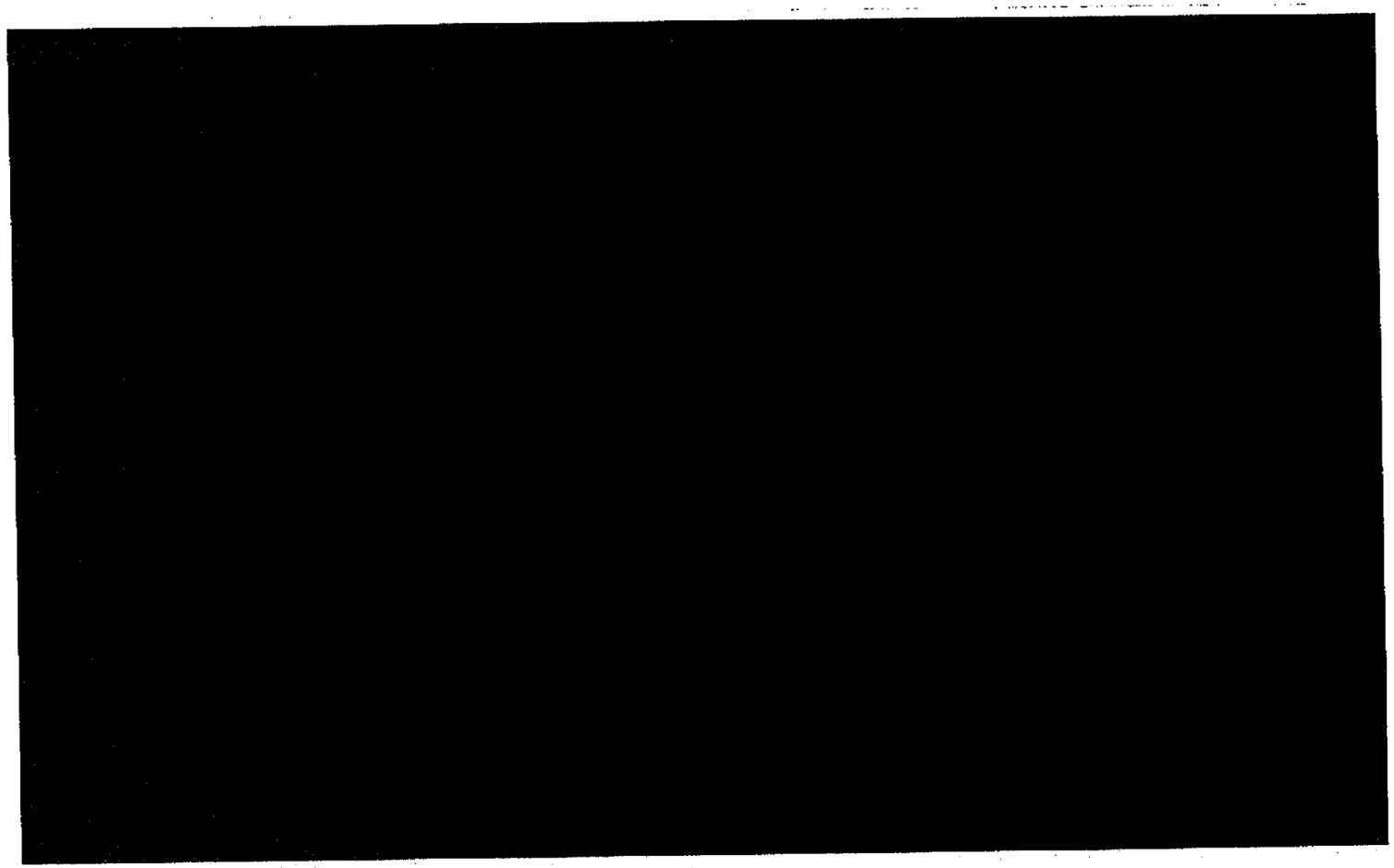
FRONT PASSENGER SEAT FUNCTIONAL FEATURE



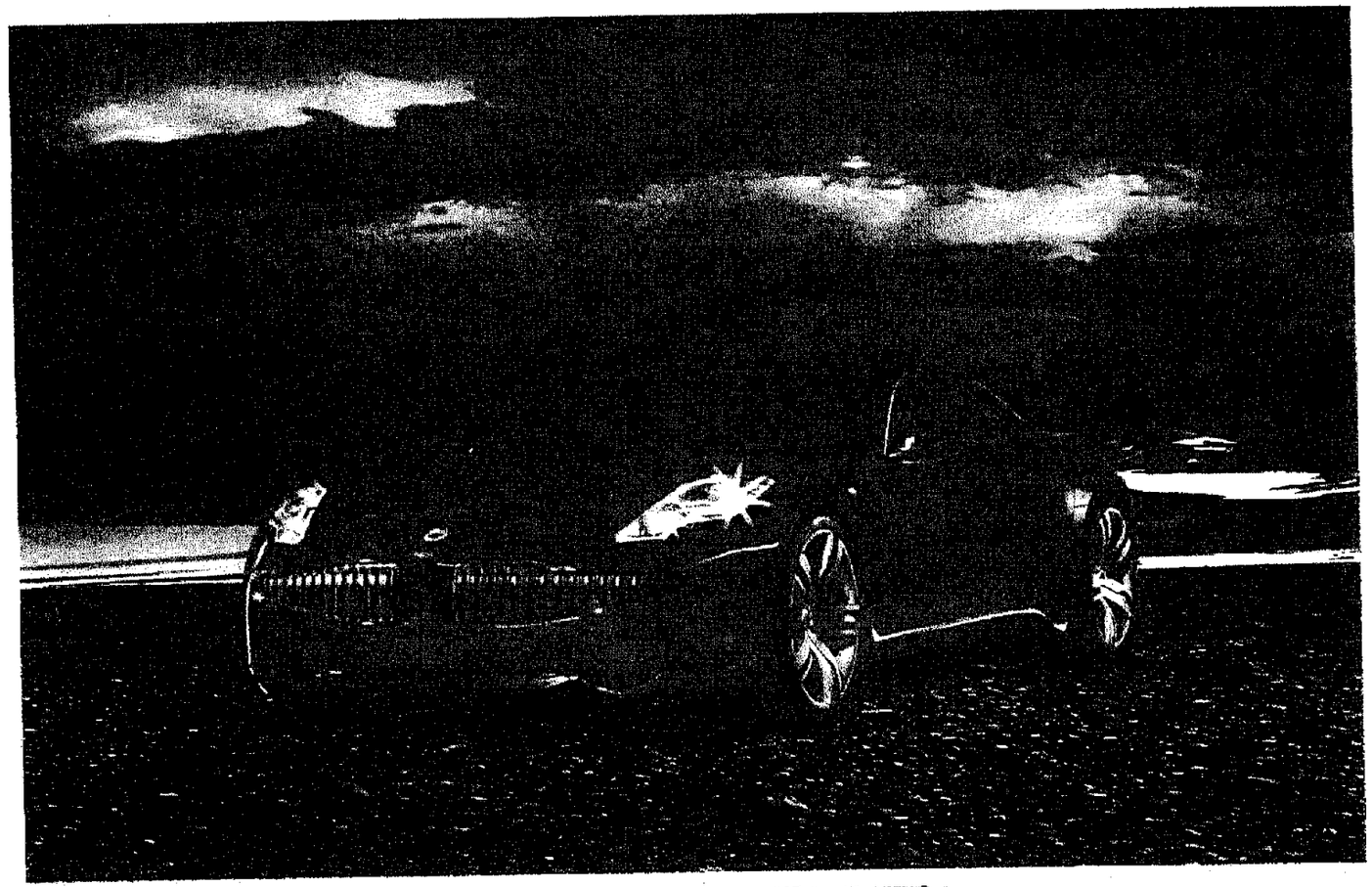
REAR PASSENGER SEAT FEATURES



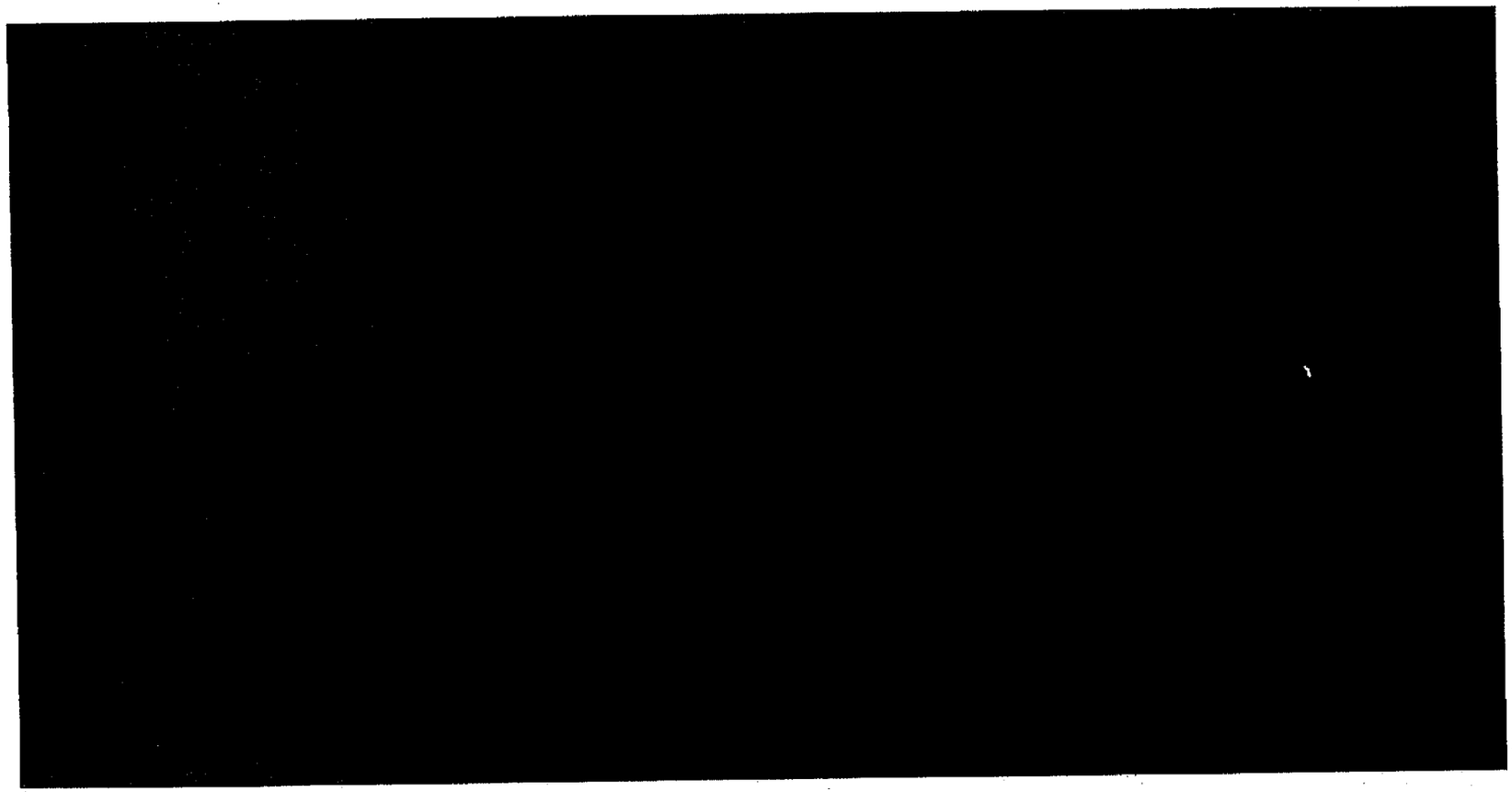
DOOR TRIM FEATURES



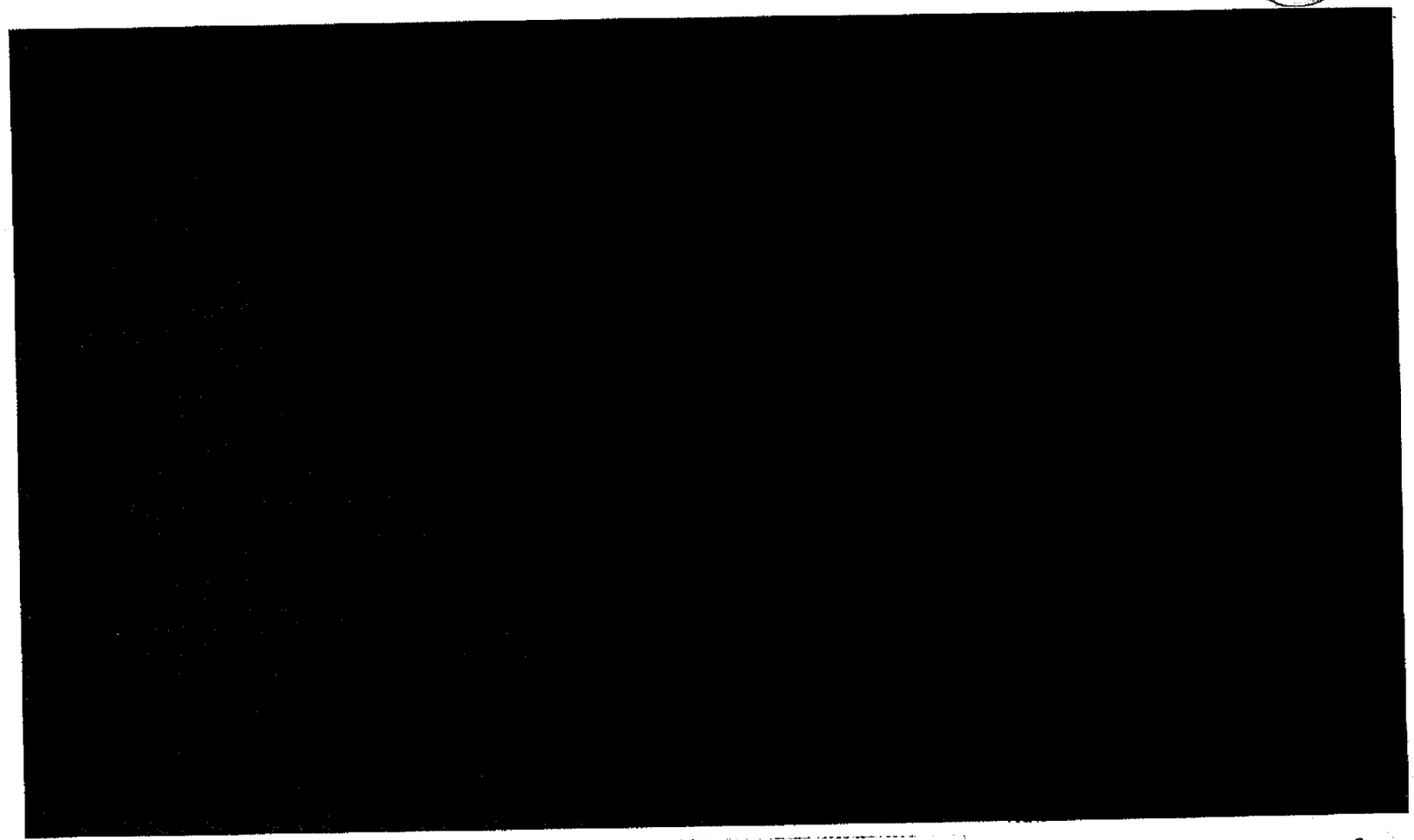
FISKER SAFTEY AND RESTRAINTS MODULE



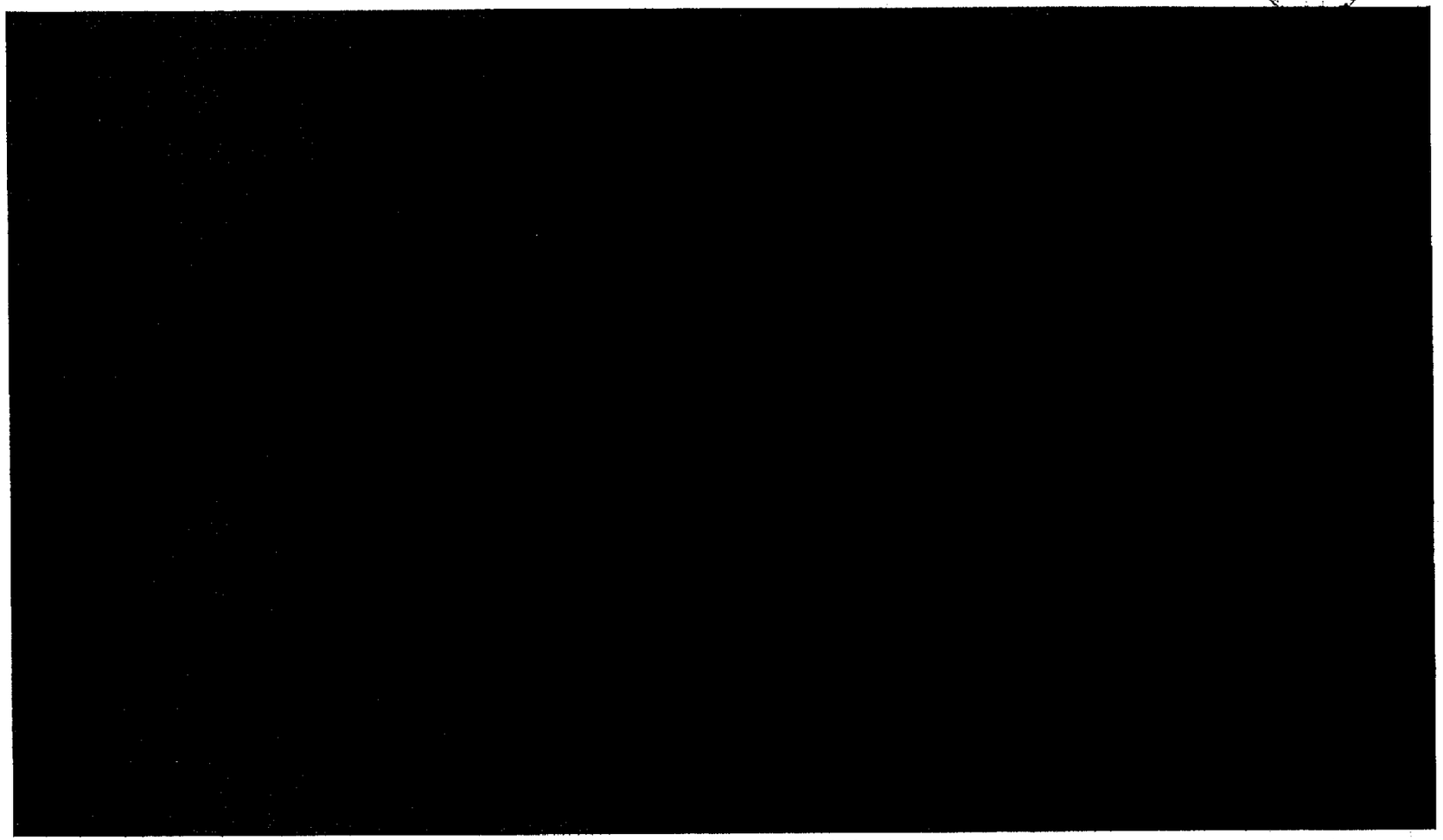
Overall Safety Restraints System



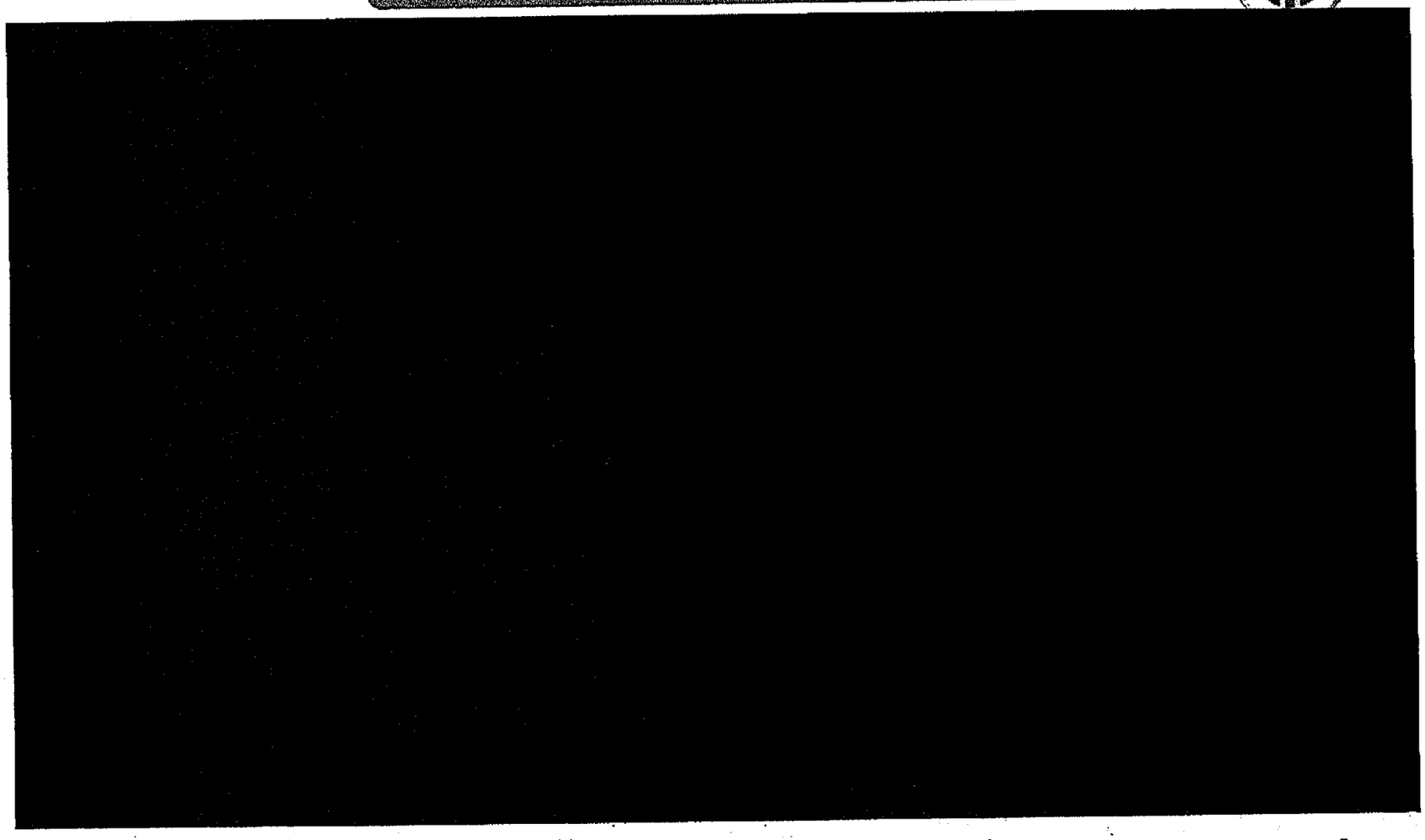
Frontal Safety Restraints System



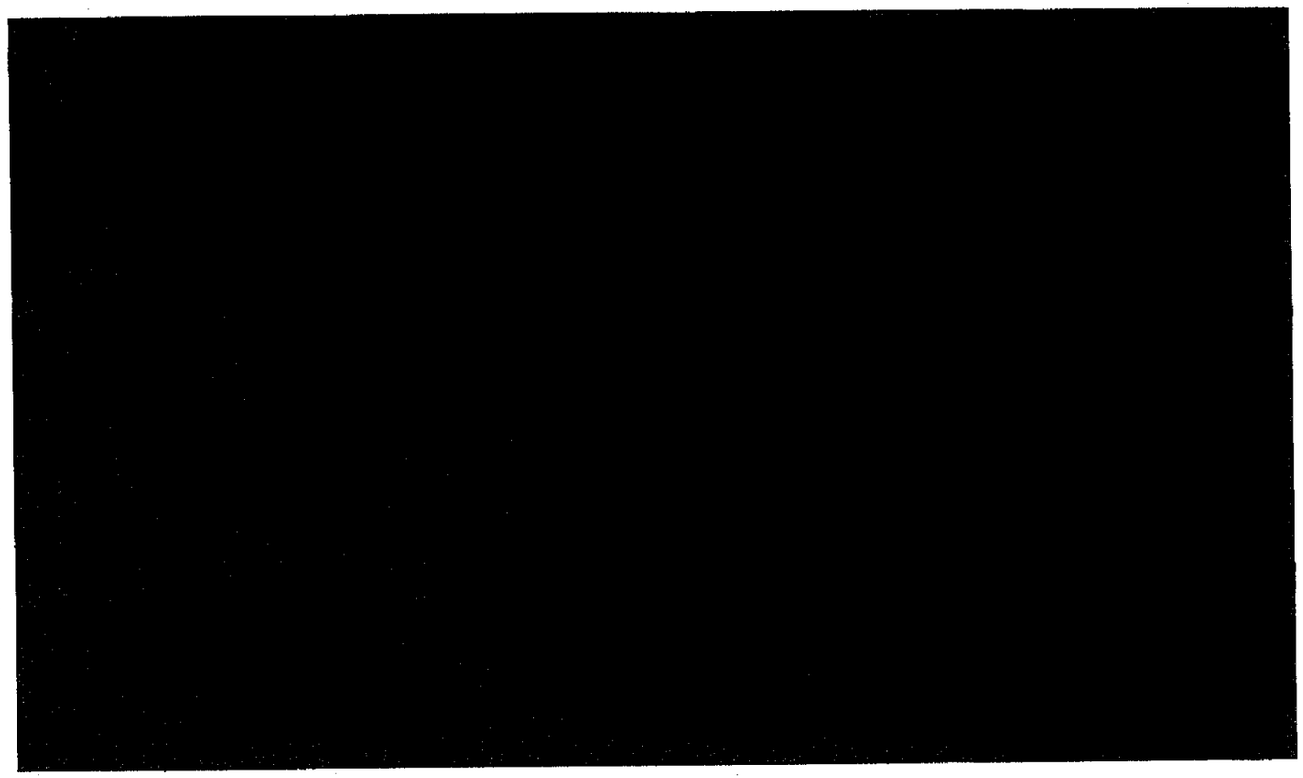
Frontal Safety Restraints System



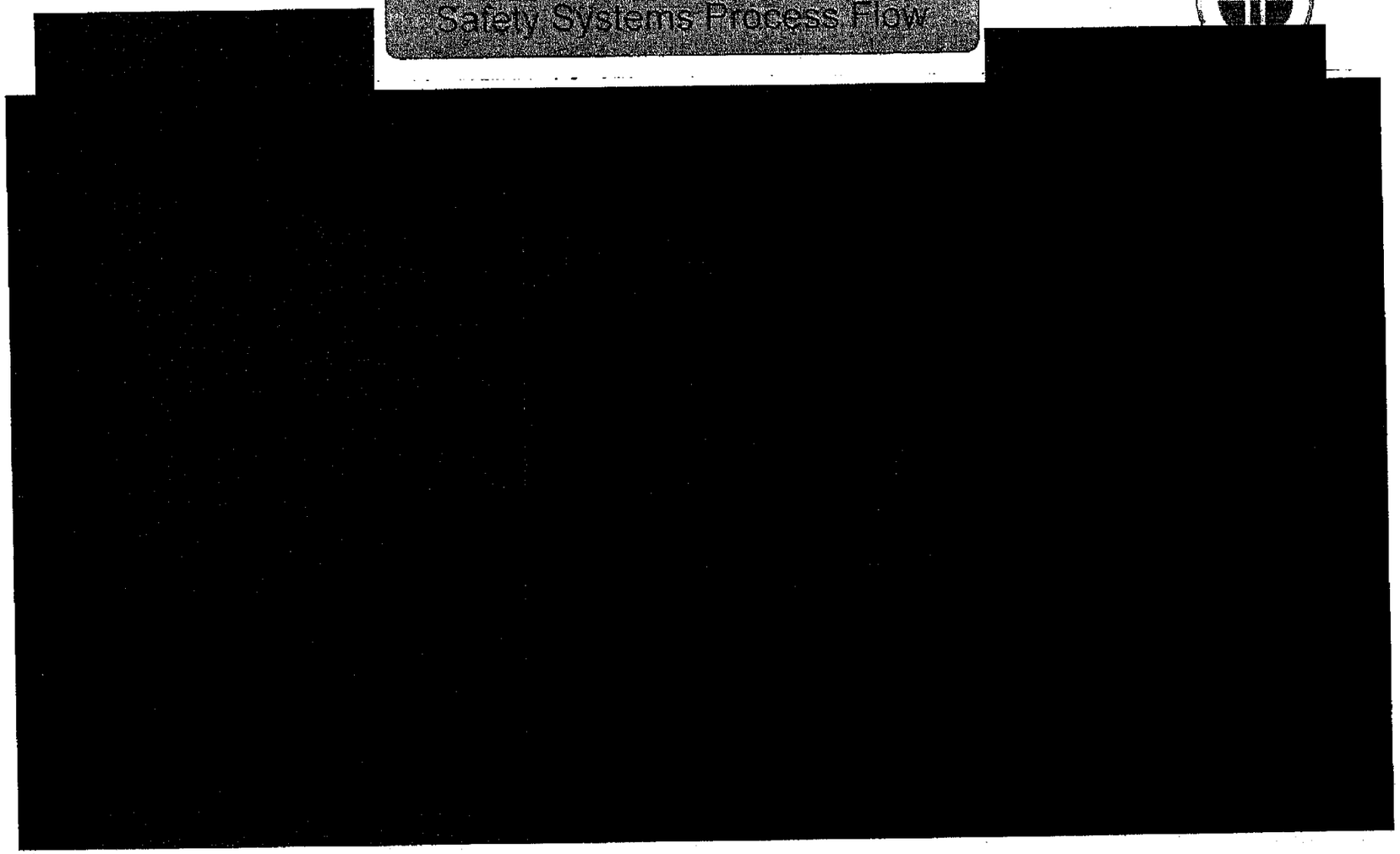
Side Restraints System



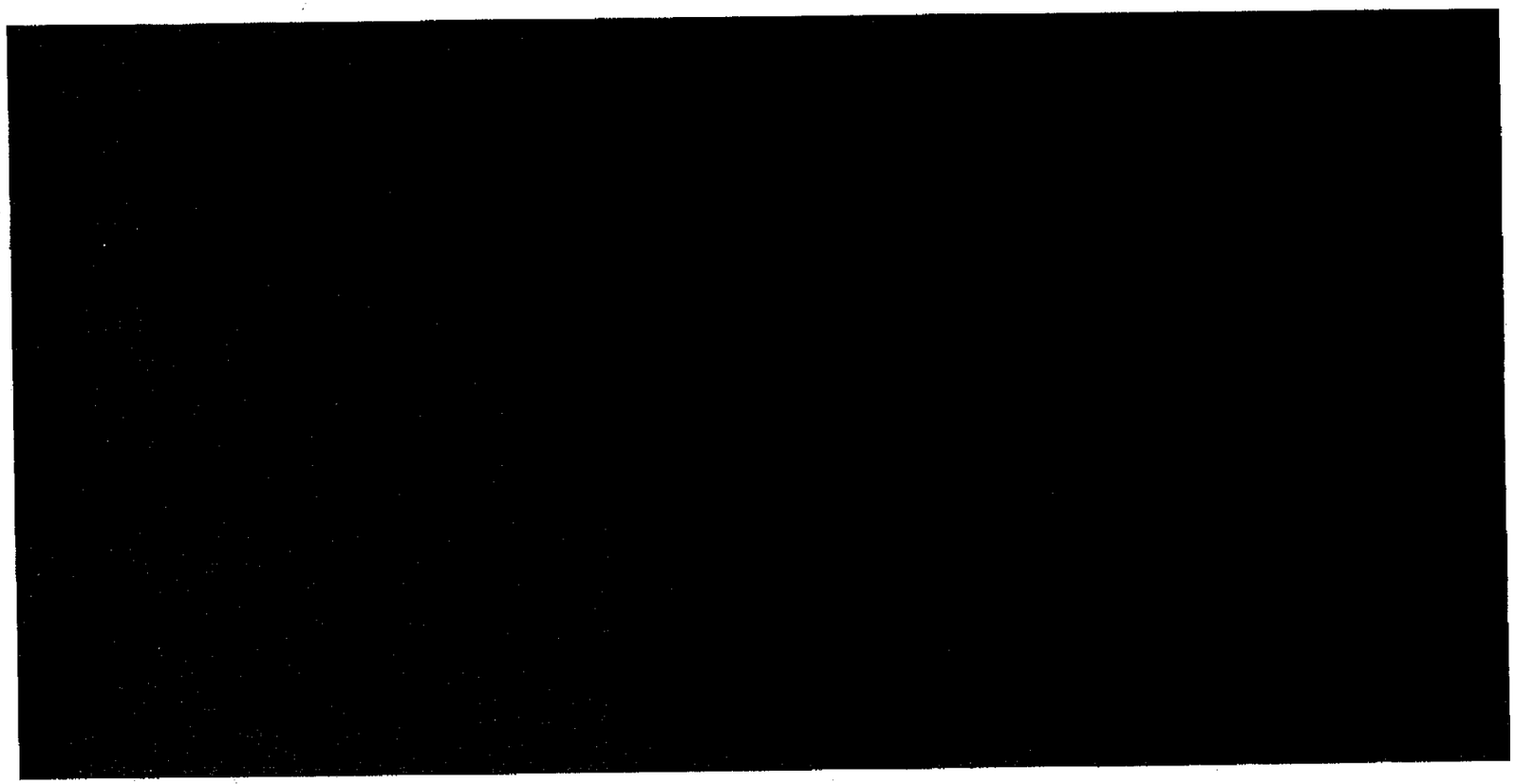
Optimisation of Divisional Activity



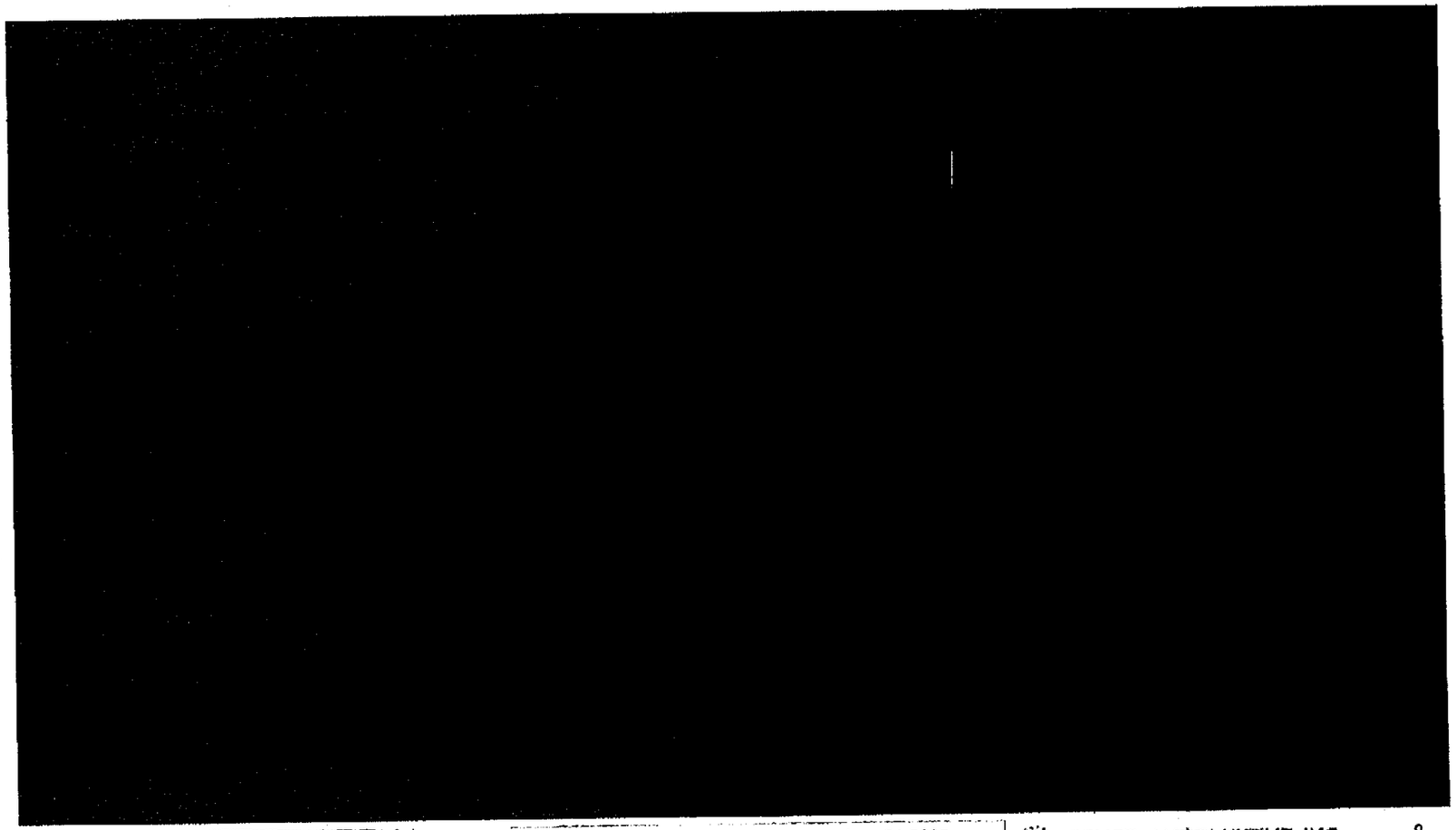
Safety Systems Process Flow



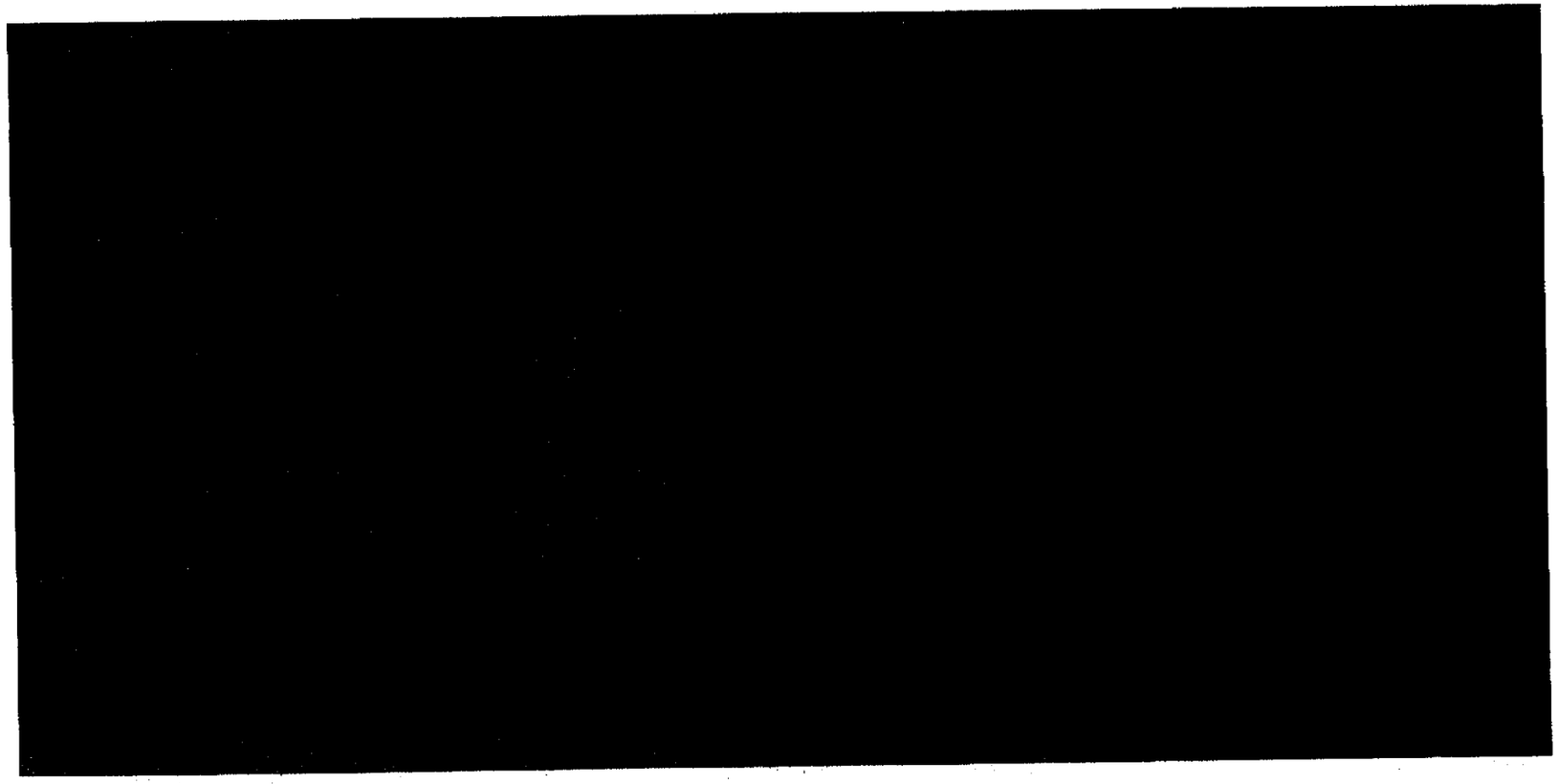
Concept Validation Phase
CAE (Computer Aided Engineering)



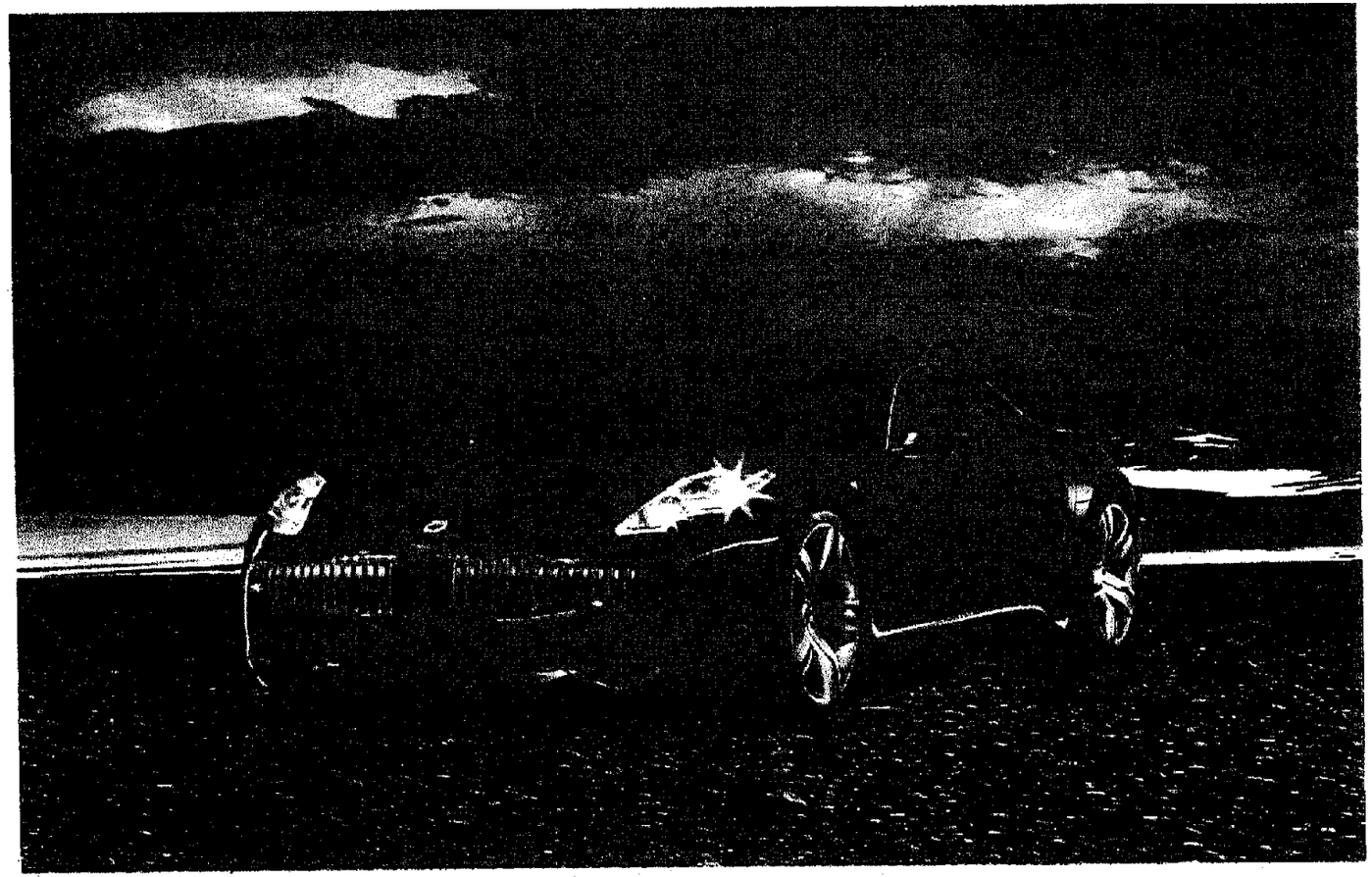
Design Validation Phase
Sled Test (Simulated Barrier)



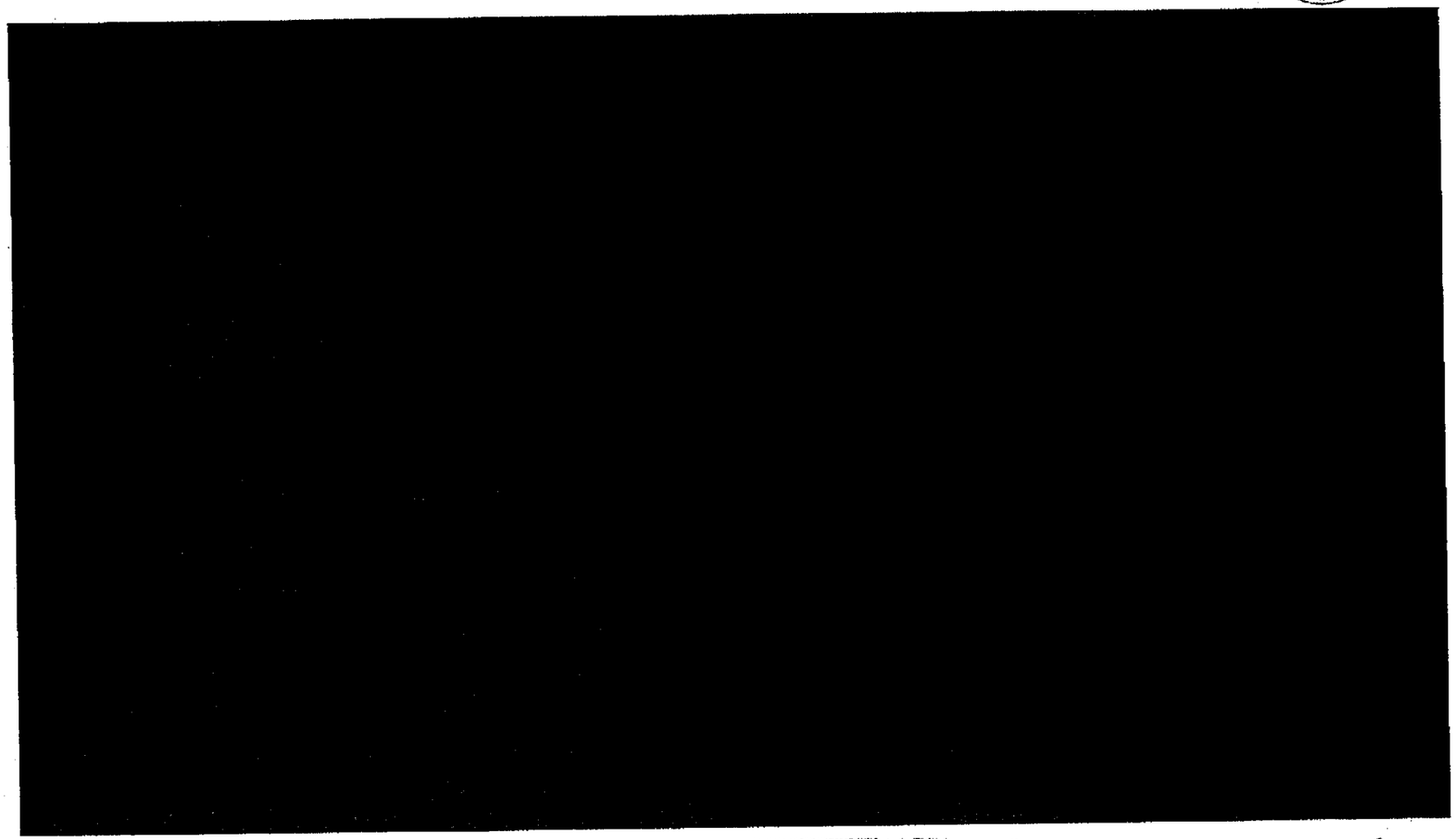
Production Validation Phase
Crash Test



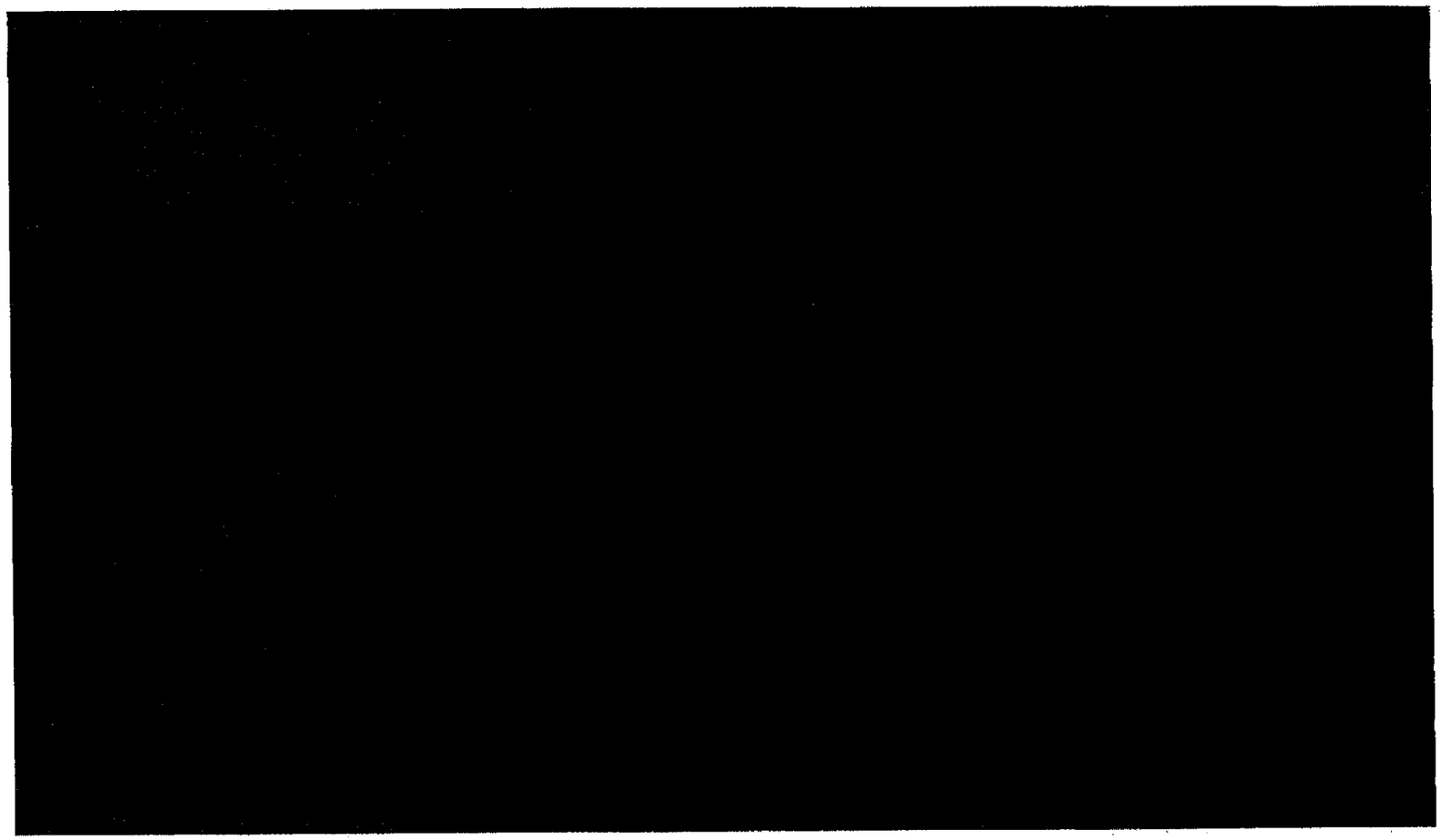
FISKER THERMAL MANAGEMENT MODULE



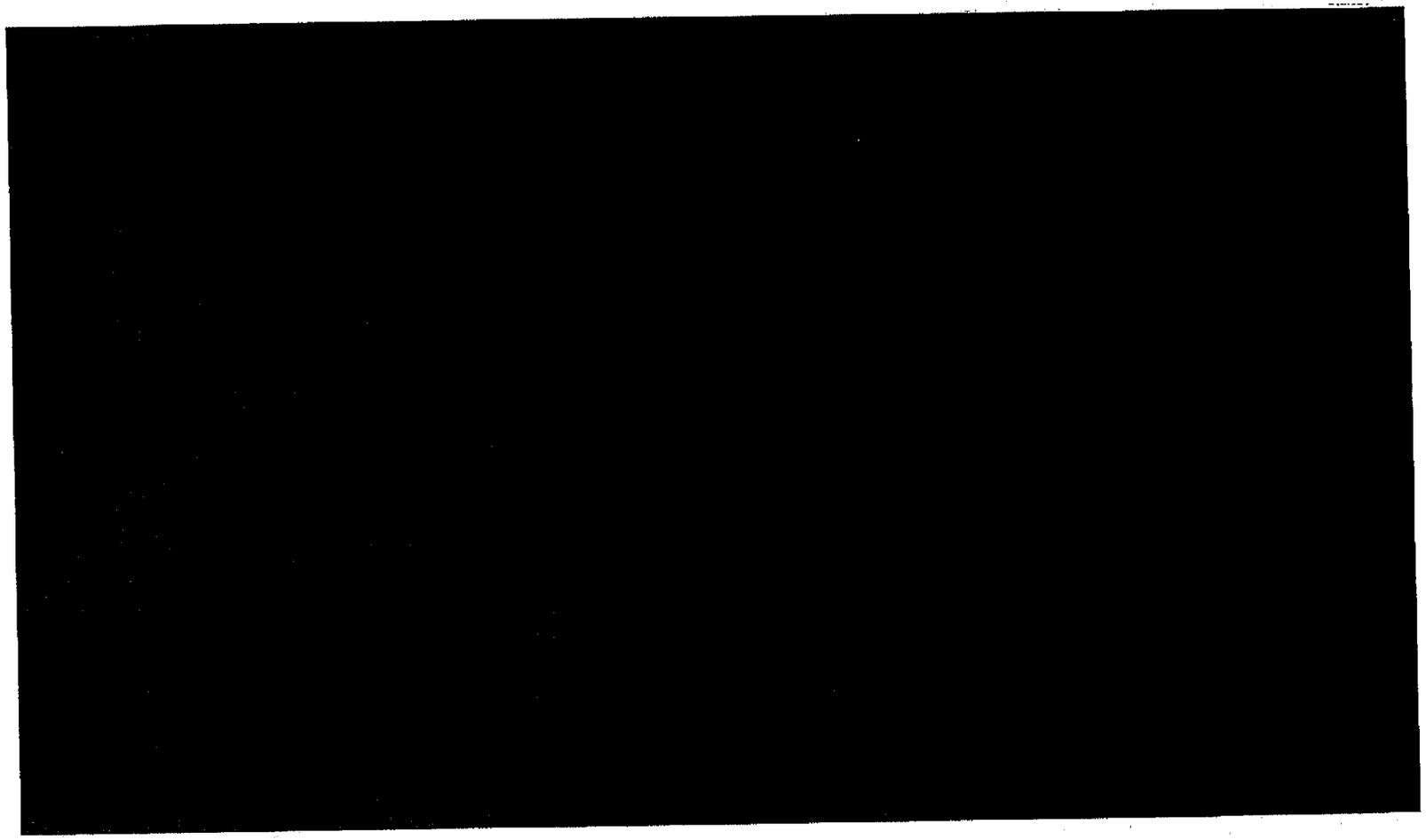
Overall Vehicle Thermal Management



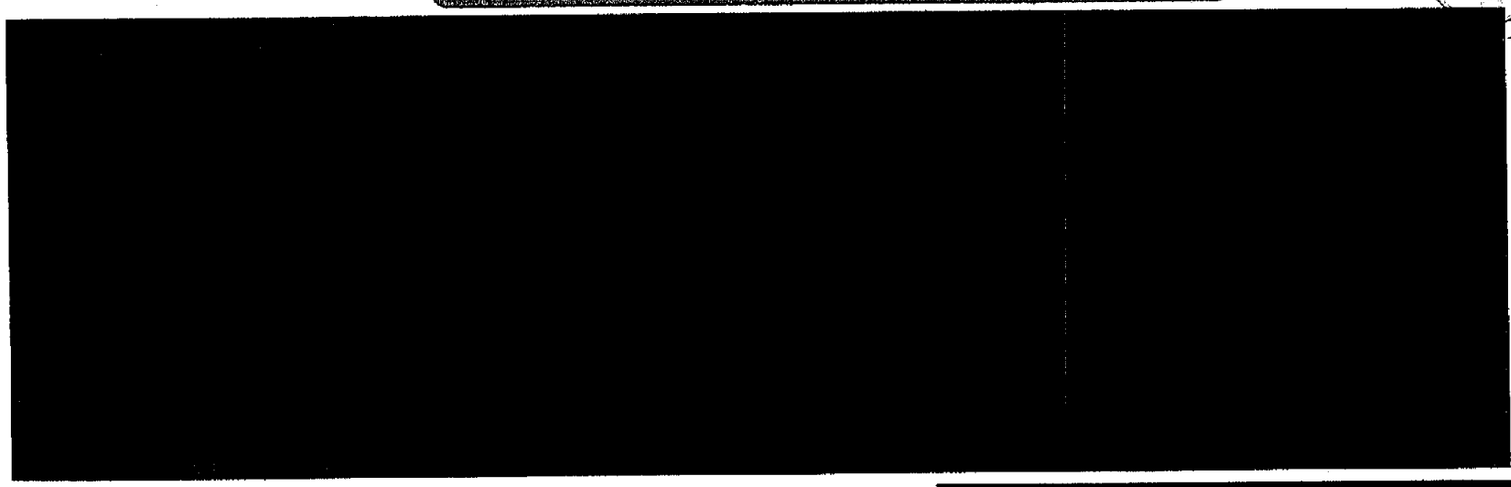
Battery Cooling

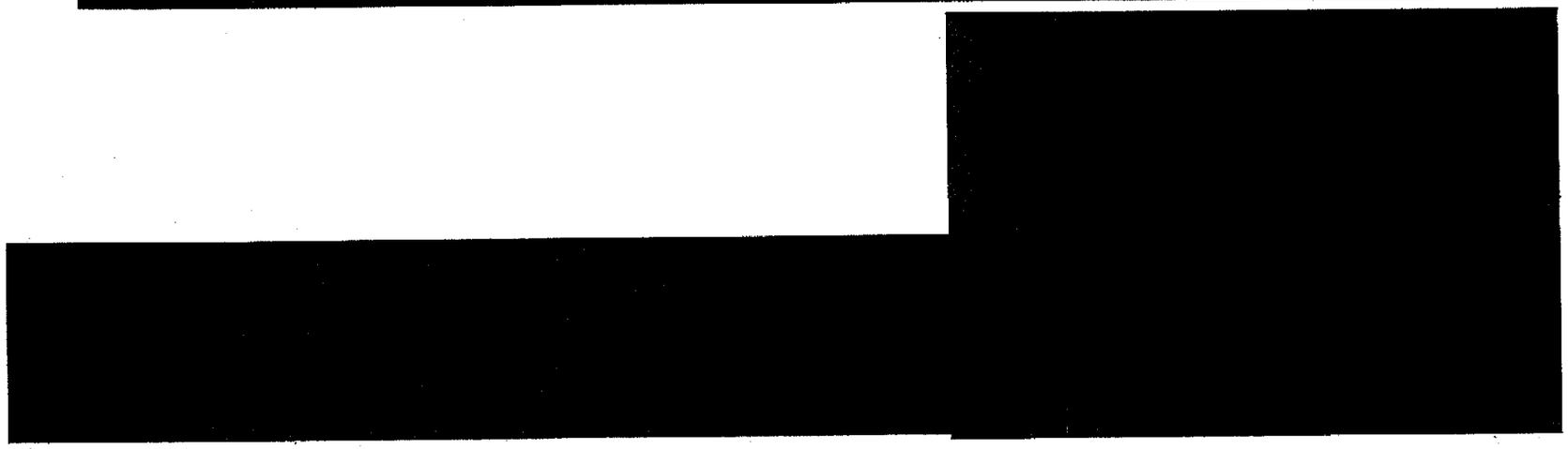


Cooling and Heating Loops

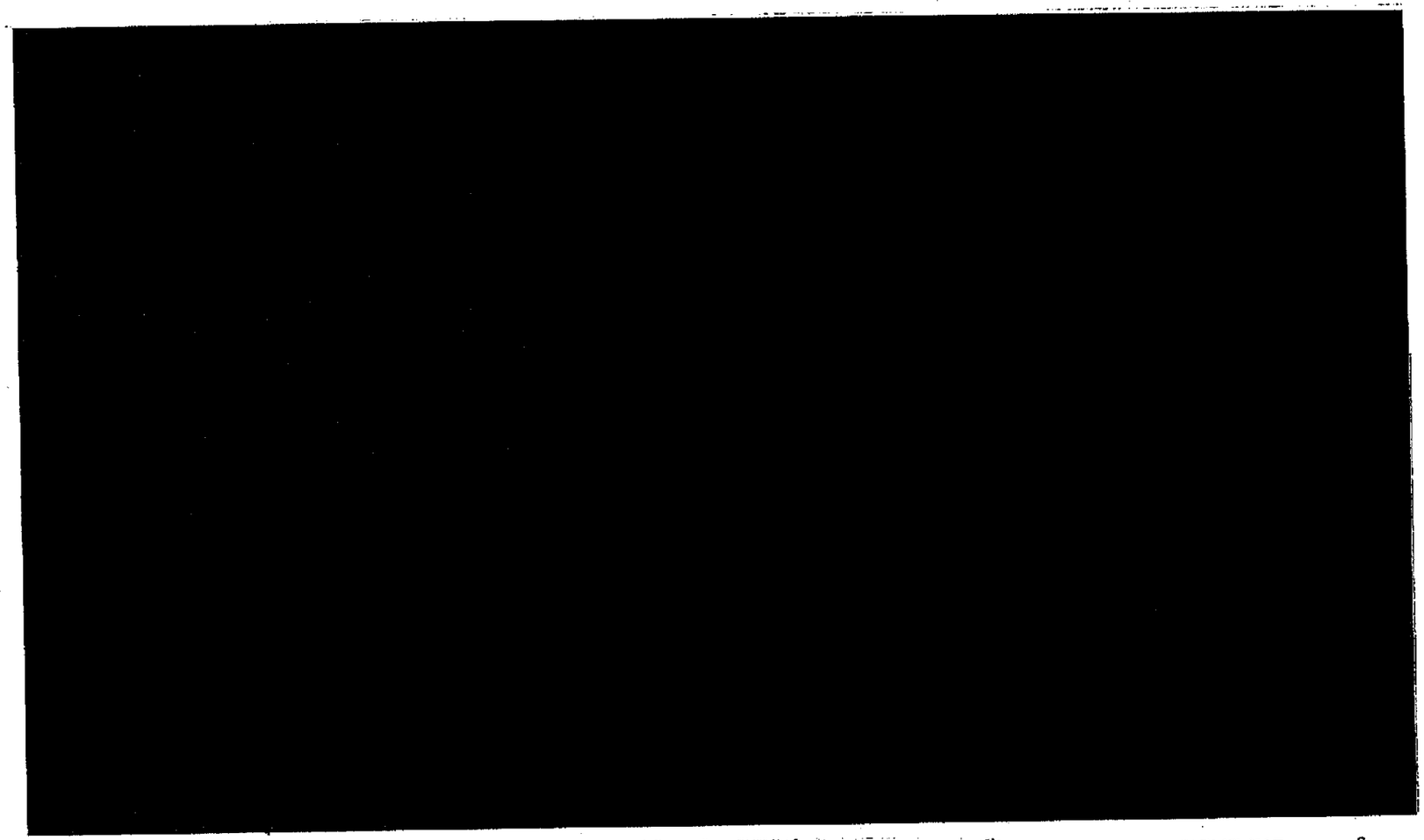


Computational Fluid Dynamics





Vehicle Pre-Conditioning



FISKER AUTOMOTIVE INC.

APPLICATION FOR PROJECT # 1 –
ENGINEERING INTEGRATION FOR FISKER KARMA

TAB 1C: ELIGIBILITY ANALYSIS

Analysis of Eligibility for ATVM Loan

Attachment 1: Summary of Fuel Economy Analysis for Fisker Karma

Attachment 2: PSAT Modeling Data for Fisker Karma

ELIGIBILITY ANALYSIS

Section 611.101(c)

> *"(c) A detailed explanation of how the proposed project qualifies under applicable law to receive a loan or award under this part, including vehicle simulations using industry standard model (need to add name and location of this open source model) to show projected fuel economy;"*

Fisker Automotive Inc. ("Fisker") is seeking a $145.3 million loan for an engineering integration project for the Fisker Karma, which would be the first vehicle manufactured by Fisker. This project would take place primarily at Fisker's existing Engineering and Development Center in Pontiac, Michigan, with support from Fisker's existing headquarters in Irvine, California. This proposed loan would cover 80% of the total cost of this project.

As required by Section 611.101(a), Fisker has certified, to the best of its knowledge and ability, that this engineering integration project satisfies the requirements of the program as set forth in the interim final regulations at 10 C.F.R. Part 611. *See* Tab 1A. The analysis supporting this certification is set forth below. This analysis addresses three issues: (1) eligibility of the applicant; (2) eligibility of the project; and (3) any supplemental DOE requirements.

1. Eligibility of the Applicant

To be eligible, an applicant must meet two criteria: (1) it must be either an "automobile manufacturer that can demonstrate improved fuel economy" or a "manufacturer of a qualifying component" *and* (2) it must be "financially viable without the receipt of additional Federal funding associated with the proposed eligible project." *See* 10 C.F.R. § 611.100(a).

Fisker is an eligible applicant because (1) it is "an automobile manufacturer that can demonstrate improved fuel economy" and (2) it is "financially viable without the receipt of additional Federal funding associated with the proposed eligible project."

a. Fisker Satisfies the "Automobile Manufacturer" Requirement

For purposes of the ATVM program, Fisker is a new automobile manufacturer – that is, an automobile manufacturer that did not manufacture vehicles in model year 2005. Therefore, Fisker must meet the criteria in Section 611.100(b)(2) of the ATVM program regulations. Under that section, Fisker must demonstrate that "the projected combined fuel economy for the relevant advanced technology motor vehicle that is the subject of the application is greater than or equal to the industry adjusted average fuel economy for model year 2005 of equivalent vehicles, based on final CAFE compliance data."

The Fisker Karma is a plug-in hybrid vehicle. As DOE acknowledged in the December 5, 2008 public meeting (transcript, p. 39), there is not yet an approved CAFE test for plug-in hybrids, nor do the interim final regulations prescribe a method for determining the fuel economy of plug-in hybrids. Instead, footnote 8 in the preamble to the interim final regulations states simply that the

applicant should submit sufficient information for DOE to determine whether the vehicle meets the required fuel economy level. *See* 73 Fed. Reg. 66,725.

Consistent with the interim final regulations, Fisker has submitted a fuel economy analysis for the Fisker Karma. *See* Attachment 1 to Tab 1C. This fuel economy analysis was prepared by Fisker and Quantum Technologies, which produces the powertrain that will be used in the Karma. Fisker and Quantum conducted this analysis using the Powertrain Simulation and Analysis Toolkit ("PSAT") as recommended by DOE in the December 5 meeting (transcript, p. 5). The PSAT modeling data is also attached, in both paper and electronic form. *See* Attachment 2 to Tab 1C.

The PSAT analysis shows that the combined (highway and city) fuel economy of the Karma is [redacted] miles per gallon when the average distance between charges is 100 miles. The actual fuel economy would be considerably higher if the vehicle is recharged more frequently, and the fuel economy would be lower if the vehicle is recharged less frequently. If the vehicle were operated entirely in hybrid-electric vehicle (HEV) mode – without any recharging of the battery – it would still achieve a combined average fuel economy [redacted] *See* Attachment 1, slide 3.

With a total passenger and cargo volume of approximately [redacted] cubic feet, and a power-to-weight ratio of [redacted] the Karma is included in the "Subcompact Performance Sedan" vehicle class.[1] The 2005 model-year combined average fuel economy for vehicles in this class was 22.8 miles per gallon. *See* 73 Fed. Reg. 66,727. Even if the Karma were never re-charged, its fuel economy would exceed the 2005 level for similar vehicles by a substantial margin.

Therefore, Fisker has demonstrated that the "motor vehicle that is the subject of the application" – namely, the Karma – "is greater than or equal to the industry adjusted average fuel economy for model year 2005 of equivalent vehicles."

b. Fisker Satisfies the "Financially Viable" Requirement

Section 611.101(l) requires an application to include "an analysis demonstrating that, at the time of the application, the applicant is financially viable without receipt of additional Federal funding associated with the proposed project, and that there is a reasonable prospect that the Applicant will be able to make payments of principal and interest on the loan as and when such payments become due under the terms of the loan documents, and that the applicant has a net present value which is positive, taking all costs, existing and future, into account." This information is included at Tab 1L and is re-stated here for ease of reference.

Section 611.100(c) lists eight criteria that DOE will consider when assessing financial viability:

> (c) In determining under paragraph (a)(2) of this section whether an applicant is financially viable, the Department will consider a number of factors, including, but not limited to:

[redacted]

(1) The applicant's debt-to-equity ratio as of the date of the loan application;
(2) The applicant's earnings before interest, taxes, depreciation, and amortization (EBITDA) for the applicant's most recent fiscal year prior to the date of the loan application;
(3) The applicant's debt to EBITDA ratio as of the date of the loan application;
(4) The applicant's interest coverage ratio (calculated as EBITDA divided by interest expenses) for the applicant's most recent fiscal year prior to the date of the loan application;
(5) The applicant's fixed charge coverage ratio (calculated as EBITDA plus fixed charges divided by fixed charges plus interest expenses) for the applicant's most recent fiscal year prior to the date of the loan application;
(6) The applicant's liquidity as of the date of the loan application;
(7) Statements from applicant's lenders that the applicant is current with all payments due under loans made by those lenders at the time of the loan application; and
(8) Financial projections demonstrating the applicant's solvency through the period of time that the loan is outstanding.

The analysis below considers the eight factors specified in Section 611.100(c) and demonstrates that Fisker meets the financial viability requirements for this program.

1. Debt to Equity Ratio. As of the date of this application, Fisker [redacted]

2. EBITDA for Most Recent Fiscal Year. Fisker's EBITDA for the most recent fiscal year is [redacted] *See* Tab 1H, p. 17.

3. Debt to EBITDA Ratio. As of the date of this application, Fisker [redacted]

4. *Interest Coverage Ratio.* As of the date of this application, Fisker [redacted]

5. Fixed Charge Coverage Ratio. Fisker's fixed-charge coverage ratio for the most recent fiscal year is [redacted]

6. Liquidity. Fisker's liquidity as of the date of this application is [redacted]

7. Lender Statements. As of the date of this application, Fisker [redacted]

8. Financial Projections. [redacted]

In considering the issue of financial viability, DOE should also consider the demonstrated willingness of leading private equity investors – including Palo Alto Investment Group, Kleiner Perkins Caufield & Byers, and Qatar Investment Authority – to invest in the company. These investors' willingness to place private capital at risk is evidence that the marketplace has confidence in the strength of Fisker's business plan and the ability of Fisker's management team to execute that plan effectively.

2. Eligibility of the Project

Two types of projects are eligible under the ATVM loan program: (1) "reequipping, expanding, or establishing a manufacturing facility in the United States to produce qualifying advanced technology vehicles, or qualifying components"; and (2) "engineering integration performed in the United States for qualifying advanced technology vehicles and qualifying components." *See* 10 C.F.R. § 611.2. The regulations define "engineering integration costs" to include "costs of engineering tasks relating to— (1) Incorporating qualifying components into the design of advanced technology vehicles; and (2) Designing tooling and equipment and developing manufacturing processes and material suppliers for production facilities that produce qualifying components or advanced technology vehicles." *See* 10 C.F.R. § 611.2.

Fisker Project #1 is an eligible project because it involves engineering integration in the United States for a qualifying advanced technology vehicle.

a. The Project Involves "Engineering Integration" Work in the U.S.

The work to be performed under Fisker Project # 1 involves "engineering integration" as defined in the regulations. Fisker has developed an operational prototype of the Karma vehicle, and has established relationships with the suppliers of each of the main components of the vehicle. The next step for Fisker, before beginning full-scale production, is to develop the manufacturing process for this vehicle. Fisker is proposing to carry out this work primarily at its Engineering and Development Center in Pontiac, Michigan, with support from Fisker headquarters in Irvine, California.

The engineering activities involved in the development of a of a Plug-in hybrid Electric Vehicle (PHEV) or Extended Range Electric Vehicle (EREV) requires that a highly integrated and interdependent system be implemented in order for this type of advanced technology vehicle to deliver the required performance and benefit promised the consumer. To that end, Fisker Automotive has concentrated significant resources and developed a new vehicle around a series EREV / PHEV powertrain system. This system was selected based on the development of a detailed set of vehicle requirements and analysis. The Vehicle Technical Specification was developed based on the "Voice of The Customer" (VOC). This VOC was applied to the development of the output analysis, which was used as the basis to develop and author the detailed system, subsystem, and component technical specifications that form the basis for the PHEV / EREV vehicle.

The Vehicle Technical Specifications describe in detail the physical and functional integration and interface requirements. These requirements are rolled out to the suppliers and Fisker

Automotive assigns engineering personnel to support the supplier in the development of the systems, subsystems, and components. This drives significant work effort in the development of new or modified components at the supplier. Suppliers are required to submit complete Analysis, Development, and Validation plans and to follow the Advanced Product Quality Planning (APQP) process.

Because this is a new "ground-up" vehicle, a majority of the vehicle systems, subsystems, and components are new and require significant integration and development at all levels and through multiple design phases. Listed below is an overview of the vehicle level subsystems and components requiring significant integration and development activities.

- Vehicle - Karma (PHEV / EREV)
- All listed subsystems are either new or required significant modification around the PHEV /EREV elements
    - Vehicle structure – New (Crash, Dynamics, structural support)
    - Chassis – New (Mass, tires, regenerative brake systems and calibration)
    - Interior – New (Battery Tunnel, HMI, driver controls)
    - Exterior – New (Unique Appearance, aerodynamics)
        - Solar Roof Panel – (Functionality, Power Converters)
    - Electrical subsystem
        - High voltage safety (New)
        - Electromagnetic compatibility (New)
        - Charging interface (New)
        - Human Machine Interface (HMI) – new displays and controls (New/Modified)
    - Powertrain
        - Electric Motors, Inverters, DC-DC Converter, Chargers (New)
        - Engine – Calibration (Modified)
        - Battery Pack (New)
        - Charging subsystems (New)
        - Engine controls and calibration (AT-PZEV) (New)
        - PT PHEV / EREV Calibration (New)
        - Powertrain drive quality (NEW)
        - Noise and Vibration (New)
    - Powertrain Interface
        - Exhaust systems New Catalyst (SULEV) (New)
        - Fuel storage and delivery (Zero Evaporative) (New)
        - Emissions – AT-PZEV (new)

Significant engineering integration, development, and calibration work will be required in order to deliver a vehicle that delivers the specified performance and benefits. In this process Fisker Automotive will develop threes sets of bench and vehicle hardware that will be used in the development and validation process. This will be comprised of a combination of [redacted] benches and Dynamometers, and [redacted] vehicles at the prototype and pre-production vehicle phases. These vehicles will be used in the development process for crashworthiness, noise and vibration,

Emissions development, electromagnetic compatibility testing, thermal, aerodynamics, fuel economy, drivability, reliability, Diagnostics, and durability.

As part of the engineering integration activities, consideration has been given to all aspects of the vehicle life cycle. Because of the advanced technology incorporated as part of this vehicle, Fisker is developing a number of unique manufacturing, assembly, and service methodologies. New fixtures, interim checks, and end-of-line tests will also be implemented in order to ensure the highest quality component and subsystem builds and vehicles. For the servicing of the vehicles, new diagnostic tools and training plans were needed and will be rolled out and implemented at the dealerships.

Upon successful completion of the engineering integration project, Fisker intends to begin full-scale manufacturing of the Karma. Initially, the vehicle will be manufactured at the existing Valmet Automotive manufacturing pant in Finland. Subsequently, Fisker intends to manufacture the Karma in the United States. The proposed "project" for purposes of this application includes only the engineering integration work, not the manufacturing of the Karma.

b. The Project Involves an "Advanced Technology Vehicle"

The work to be performed under Fisker Project # 1 involves an "advanced technology vehicle" as defined in the regulations. Section 611.2 defines an "advanced technology vehicle" as one that meets three criteria:

> (1) The Bin 5 Tier II emission standard established in regulations issued by the Administrator of the Environmental Protection Agency under section 202(i) of the Clean Air Act (42 U.S.C. 7521(i)), as of the date of application, or a lower-numbered Bin emission standard;
>
> (2) Any new emission standard in effect for fine particulate matter prescribed by the Administrator under that Act (42 U.S.C. § 7401 *et seq.*), as of the date of application; and
>
> (3) At least 125 percent of the harmonic production weighted average combined fuel economy, for vehicles with substantially similar attributes in model year 2005.

1. The Vehicle Will Meet Tier II Bin 5 Emission Standards. The gasoline engine used in the Karma is the GM LNF 260hp 2.0 Liter Direct Injected Turbo charged "Ecotec" engine from General Motors (GM). The same engine is being used by GM in the Pontiac Solstice and is currently certified in that application to Tier II Bin 5 standards. Additional testing is needed to ensure that this engine meets Tier II Bin 5 standards when installed in the Karma. Fisker has adopted a two-phased approach to emissions certification for the Karma:

- In Phase 1, the Karma will be certified as meeting the Tier II Bin 5 emission standards – the minimum level required for eligibility under the ATVM program. Phase 1 includes the initial,

low-volume production of the Karma – a total of approximately 100 saleable vehicles. Phase 1 emissions certification is scheduled to occur in the fourth quarter of 2009.

- In Phase 2, the Karma will be certified to the AT-PZEV (Alternative Technology, Partial Zero-Emission Vehicle) Standard, which is more rigorous – that is, it requires lower emissions than the Tier II Bin 5 standard. Phase 2 includes the high-volume production run for the Karma. Phase 2 emissions certification is scheduled to occur in August 2010.

In short, the Karma will meet and exceed the "Tier II Bin 5" emission standards.

2. New Emissions Standards for Particulate Matter Have Not Been Issued. The EPA has not issued any "new emissions standard ... for fine particulate matter" since November 12, 2008, when the interim final regulations for the ATVM program were issued Therefore, no additional finding is needed with regard to paragraph (2) in the definition of "advanced technology vehicle."

3. The Vehicle Meets the Fuel Economy Requirements. [redacted]

In sum, the Fisker Karma is an "advanced technology vehicle" because: (1) it will be certified to meet, at a minimum, the Tier II Bin 5 emission standards; (2) there are no new particulate matter standards that need to be considered; and (3) the vehicle is a Subcompact Performance Sedan that will have combined average fuel economy of 28.5 mpg or greater.

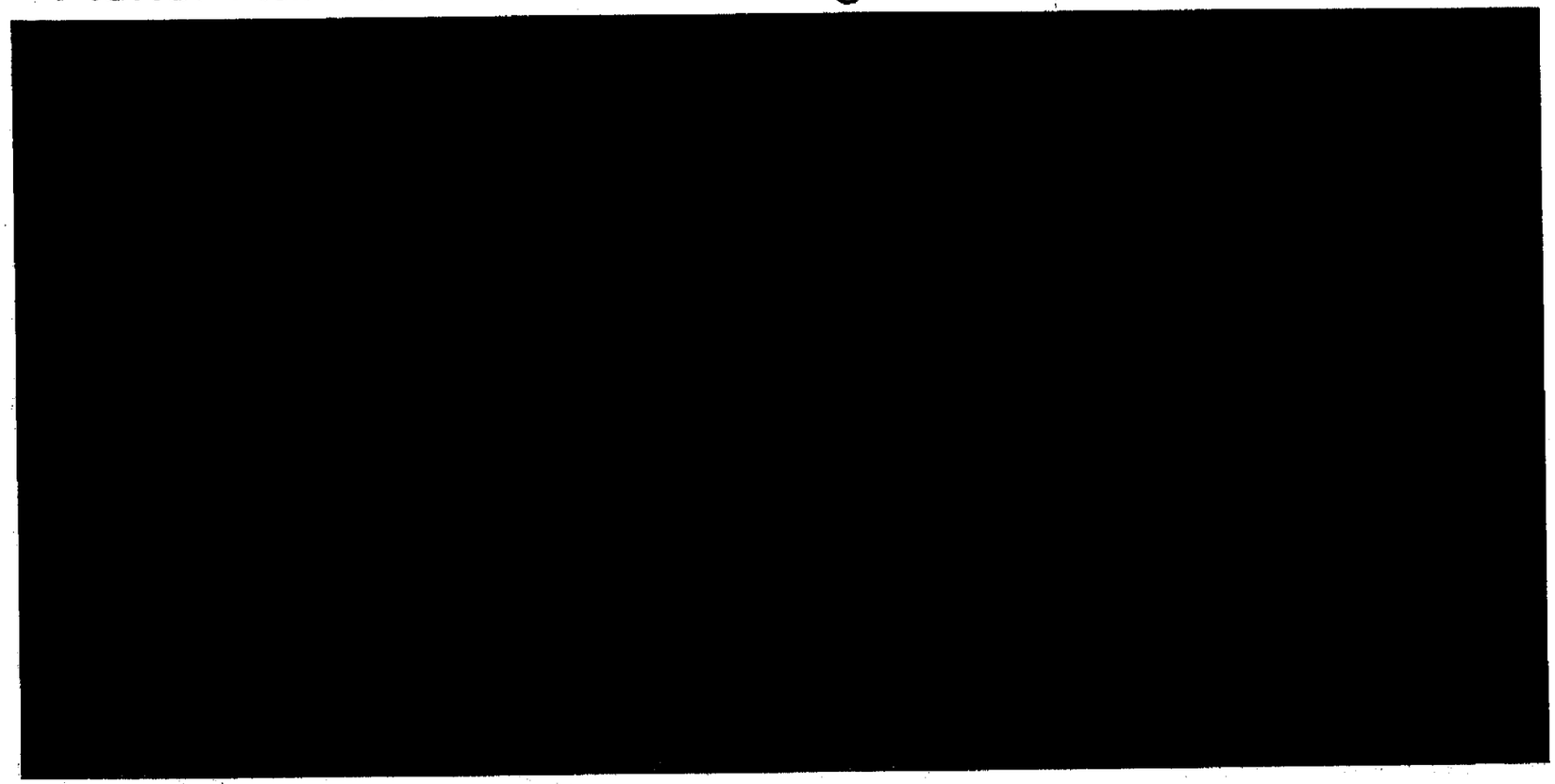
3. "Supplemental Requirements" Have Not Been Issued

As of the date of filing of this application, no supplemental requirements pertaining to this program have been issued by DOE. Therefore, this certification does not address any supplemental requiremems. If DOE issues supplemental requirements in the future, prior to closing a loan agreement with Fisker, Fisker will make its best efforts to modify its proposal to conform to any such requirements. Fisker also reserves the right to withdraw this application at

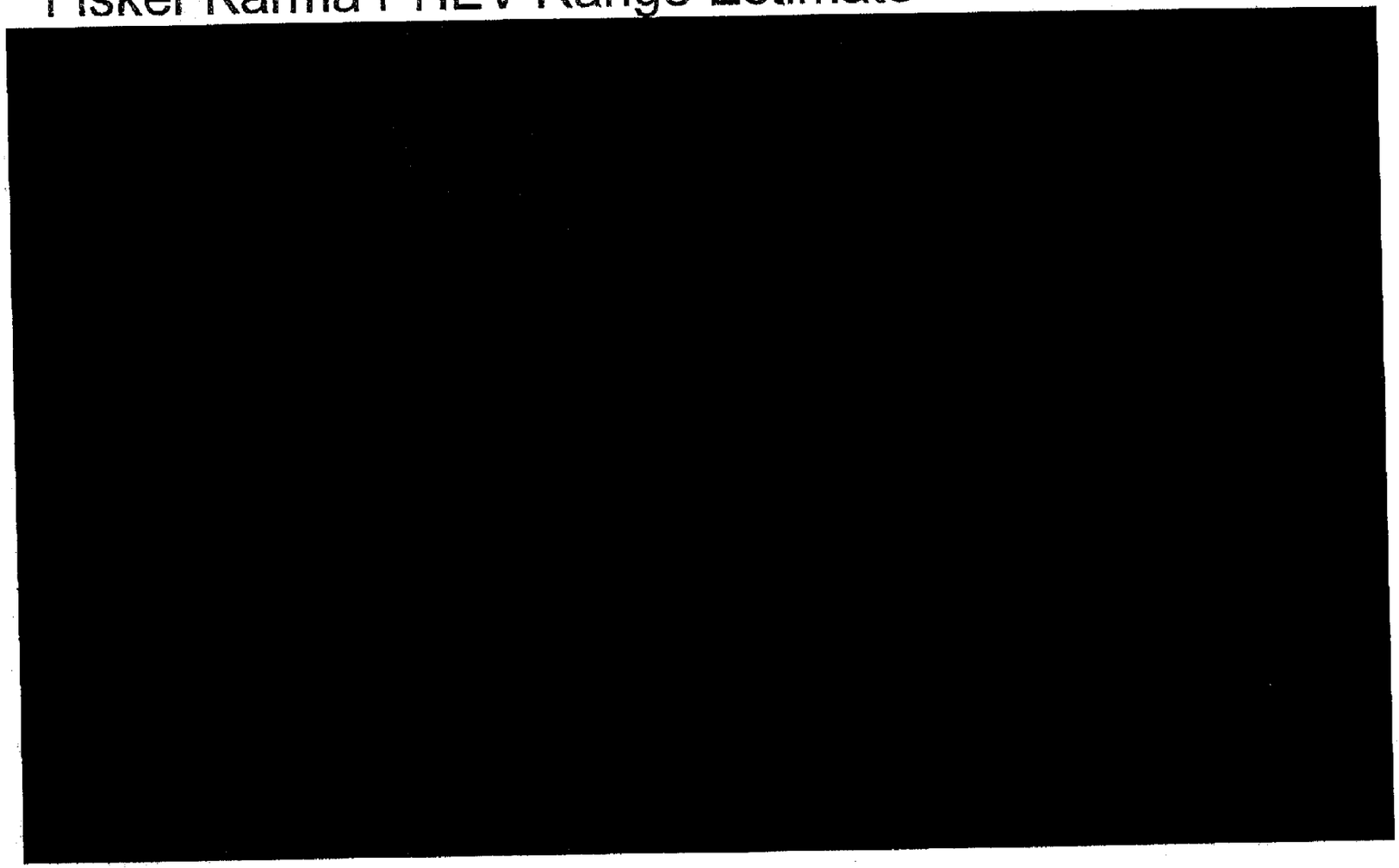
[2] See footnote 1 for explanation of the power-to-weight ratio.

any time and for any reason, including but not limited to a determination by Fisker that new requirements issued by DOE cannot be satisfied.

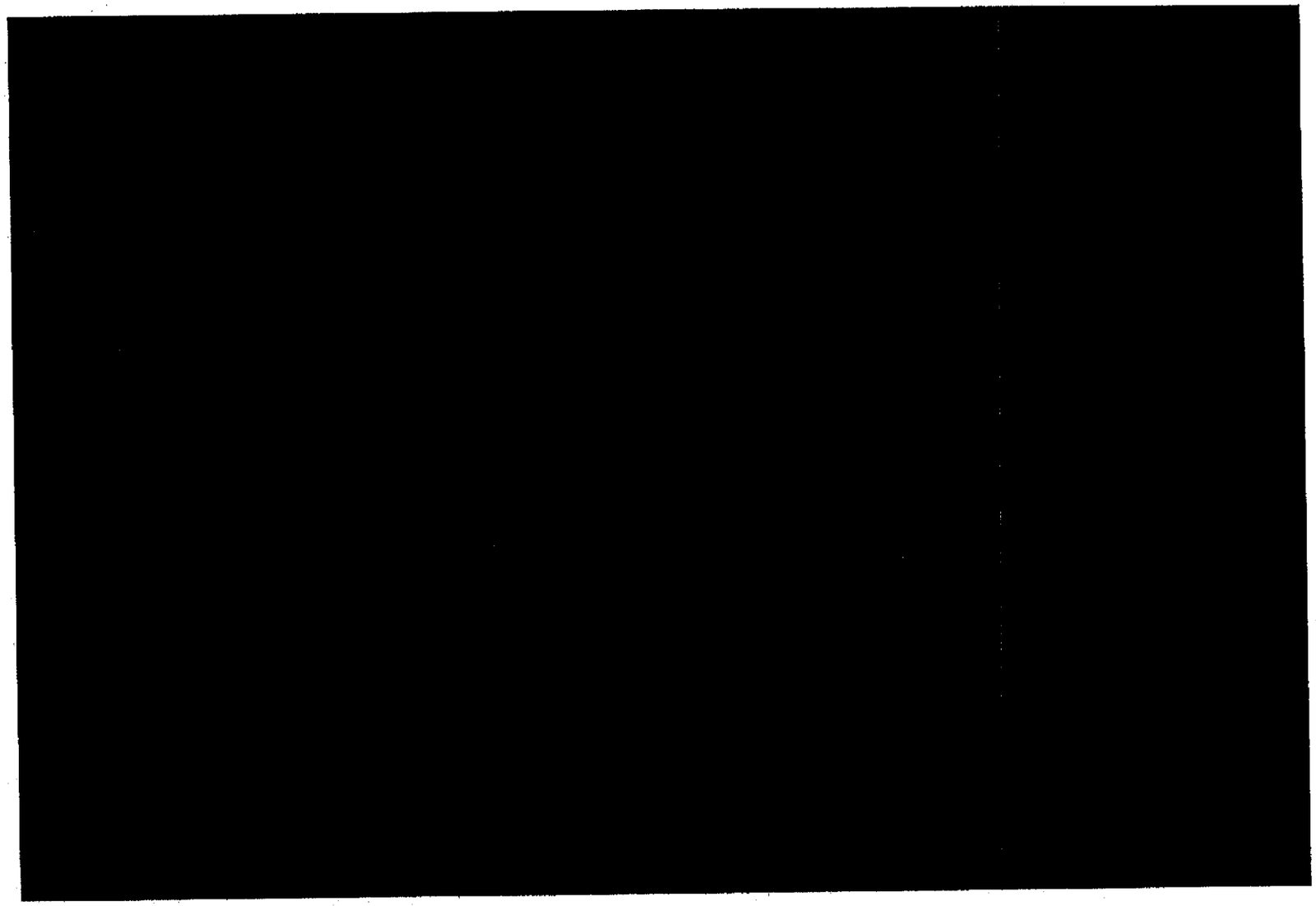
Fisker Karma Estimated Mileage



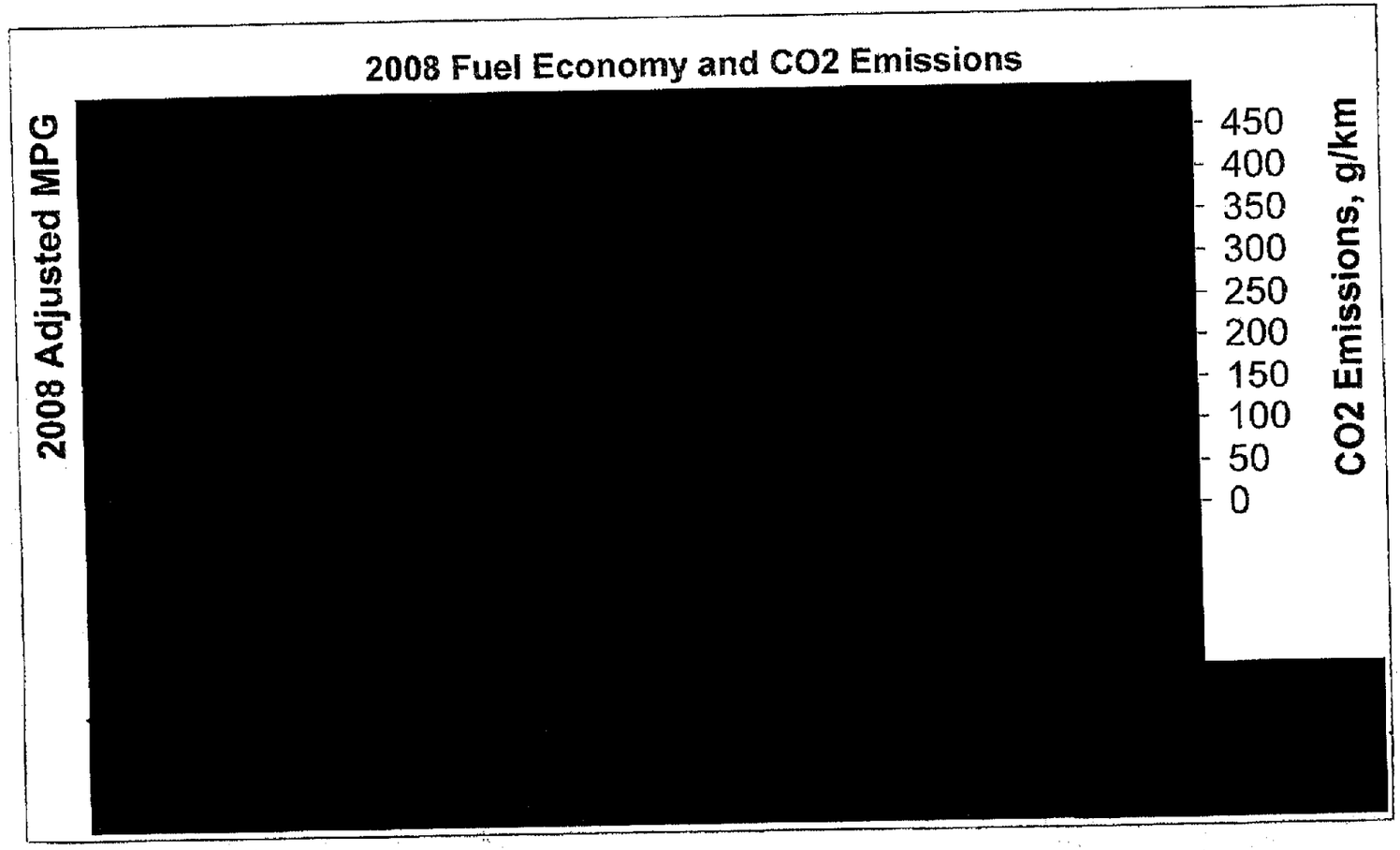
Fisker Karma PHEV Range Estimate



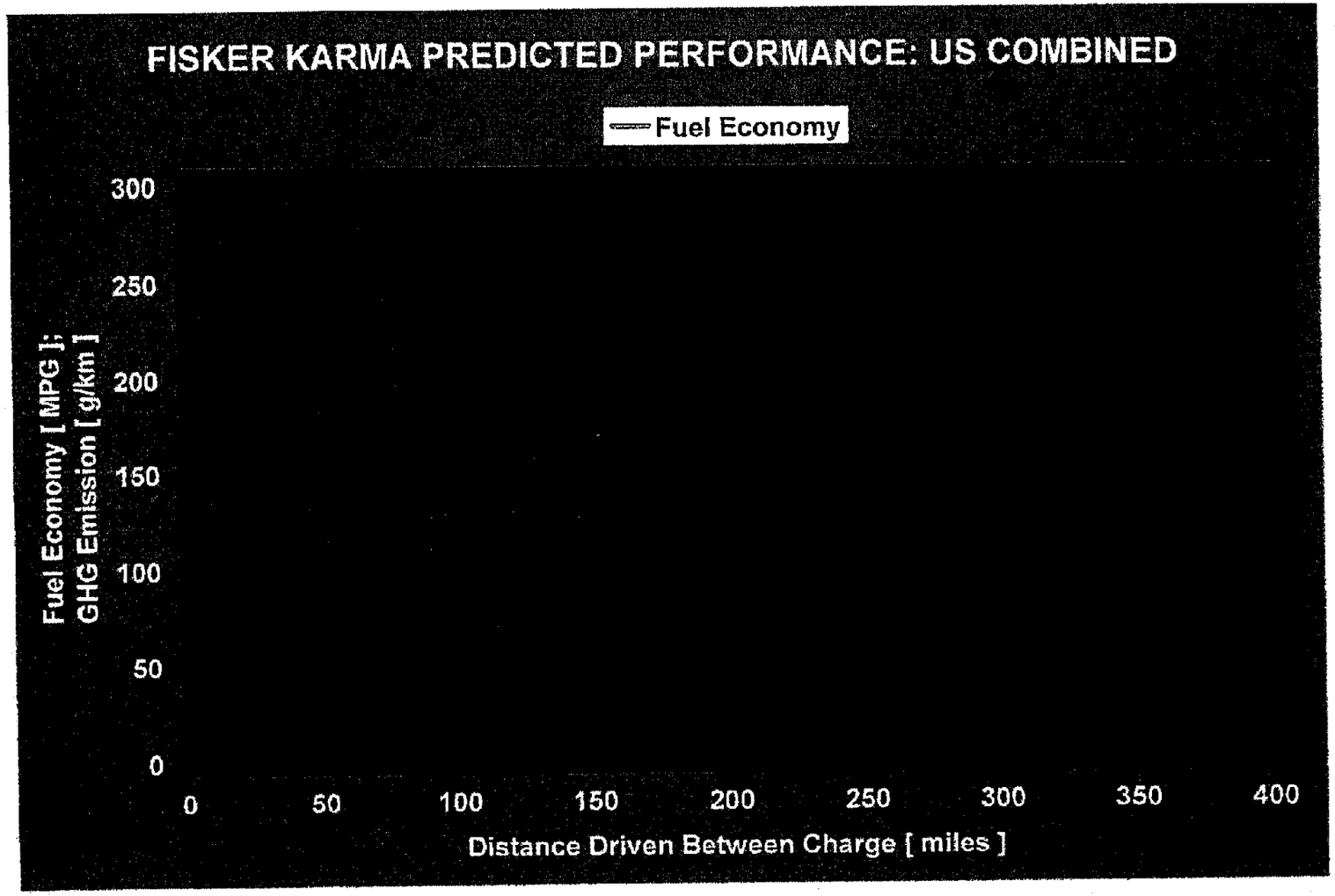
Fisker Karma Mileage Summary



Fisker Karma Mileage Summary



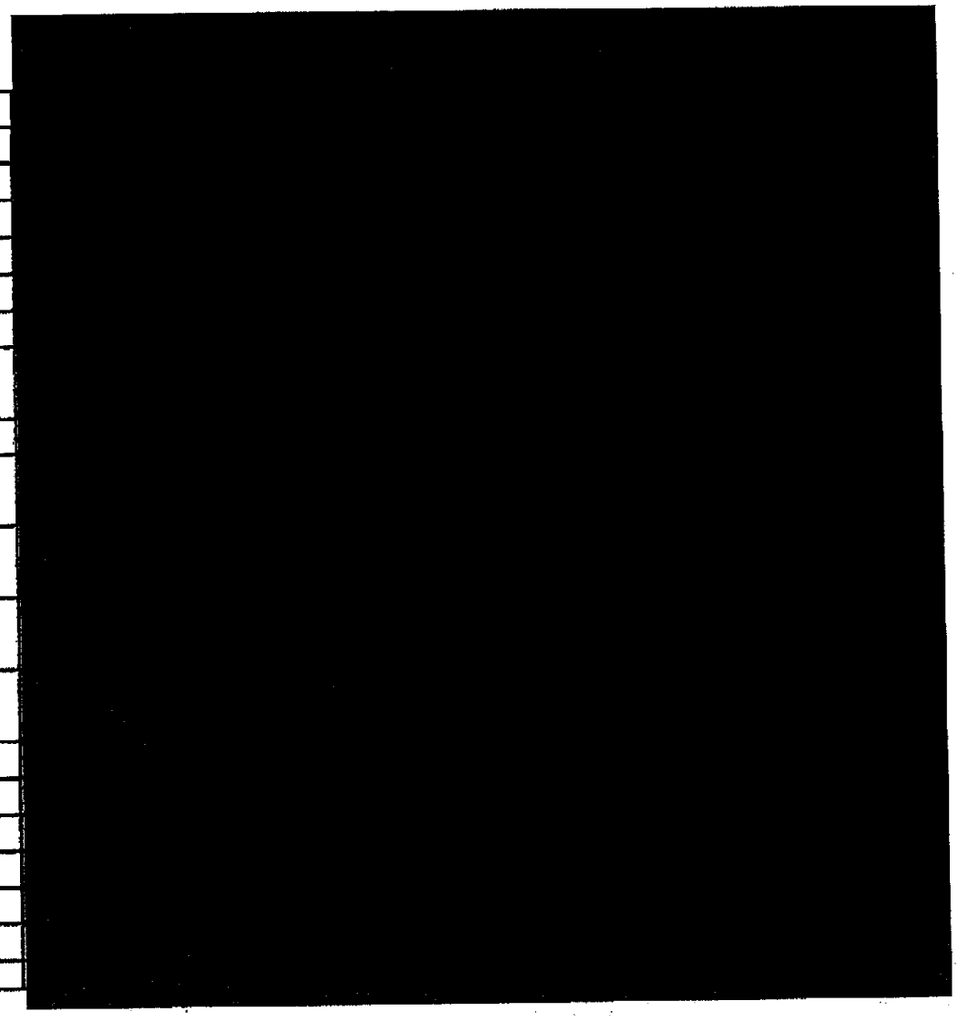
Fisker Karma Mileage Summary



Simulation Assumptions

Vehicle Design Parameters

Charicteristics
Rear wheel drive
Wheel base
Weight distribution
Center of Gravity Height
Coefficient of Drag (Cd)
Vehicle Frontal Area
Tire size and specifications
Tire Rolling Resistance
Auxiliary Power demand, Max. cont.
Auxiliary Power demand, Test
Mechanical Accessory Losses
Road condition, Brake + Acceleration Force
Passenger Capacity
Cargo Volume
Curb Weight
Payload
Driver Weight
Vehicle Test Weight
Regenerative Braking



PSAT Input Summary File – Provided Separately