JASTI 2013年度のReviewと2014年度活動方針

JASTIユーザー会議
2014年2月12日・沼津

2014年2月13日訂正

海外活動計画の現状

□ 目的

製造メーカーとしての認知の浸透による需要開拓

↓

各種展示界への出店とReference取得の為の製品評価
CFR49 Part 572 NHTSA図面との整合性、
計測器としての製品一信頼性、繰り返し特性、互換性

□ 市場開拓状況

代理店の設定と評価スケジュール

□ 今後の展開とスケジュール

海外市場開拓状況

□ 米国、カナダ、メキシコ & ラテンアメリカ
→ JASTI-UTAMA Inc. →メキシコに代理店の設定
□ 韓国ーA&G

現代自動車ーH3-50%完了、Ssan Yong-H3-5F、KATRI →完了
2月にGM Korealに2体（50%、5%）の評価計画中
□ 中国ー精華大学等 (50% 1体)ーCATARCにて評価予定
□ ASEANーTAG SDN BHD(Malaysia)
MIROS- H3-50% x 2体、5Fx1体、ES2 x1体の供給と評価＋校正試験
ES2の供給を2014年1月より開始、校正試験設備3月中の設置予定
□ インドーTesscorn →Automotive Test Systemsに代理店の変更
TATA MOTOR, ARAI,Autoliv/India- H3-50%→ARAI評価終了
□ 欧州 ー Kistler Group(欧州)との提携
PDB 5F (完了） BASt/BGS (完了） ＋ ACTS
※Cellbond社ダミー開発には弊社は一切関与しておりません。

今後の展開とスケジュール

□ 評価結果のとりまとめと改善点の対応

評価結果と改善点の情報発信→品質＞納期、価格

□ ダミーメーカーとしての情報発信

中国語Web Pageの掲載→日・英HPの刷新
JASTI-UTAMAのHPの掲載→未着手

□ 国内メーカーによる評価試験の実施

→一部実施済みですが、改めて部品単体評価の実施を計画

□ 情報発信Toolの充実等

→ PRODUCTS Catalogueの完成

2014年度活動重点項目

□事業の柱をダミー製造販売へ

人材の育成と技術の継承

□海外での評価完了に伴い国内市場評価

まずは部品単位での評価の実施

□原点に立ち返り品質優先の経営

モールド製品、リブ、ゴム製品の信頼性（繰り返し特性、耐久性、再現性）を絶対的なレベルまで引き上げる

□新規開発中の製品の開発を早期完了し製品化する

優先開発:WorldSID50, H3-95th

資源の集中と選択ーFLEX GTR

□製造能力強化の為の新社屋への移転

製造環境の整備と安定した品質確保の為にNew Plant 計画中

JASTI WorldSID50 Update and other dummy specification

ISO/TC22/SC12/WG5

2013/5/14 Berlin

JASTI Co., Ltd.

Information from Others

- WorldSID50 Development update.
- Hybrid-III 5F Chest Jacket
- FMVSS226

World SID 50

	April	May.	June.	July	Aug..	Sep..	Oct.
Head ass'y	3D review	Mold refined Production	Repeat test And refine				
Neck Ass'y	Test and Review	Rubber Spec confirmed.	(Production)	Repeat test			
Shoulder Rib Chest Rib Abdominal Rib	3 different Rib set production	Impact test New Rib set from test Results	Damping material study Final Sepc ? .	Durability test Stability test			
Pelvis Ass'y	Two different models	Impact test Original shape	Repeat test	(Production) Confirmation test	Repeatable test		
Others			Evaluation test			Summary	
Chest sensor	Sensor works with sensor manufacture		Max. Deflexion Should be set As Rib Spec.??				

- All listed parts have been developed under latest ISO 9790 &15830.
- World SID 5F and others dummy development are followed in 2013

Hybrid-III 5F Chest Jacket specification

(A).JASTI dummy parts are all interchangeable to 49CFR Part 572 requested specification.

(B).JASTI follows (SAE) harmonization committee results;

New SAE 5F Chest Jacket is different from CFR Part572 5F at some points as figure in next page.

(A) is not same as (B).

Is this change as Part572 H-III 5F specification?

Main different points

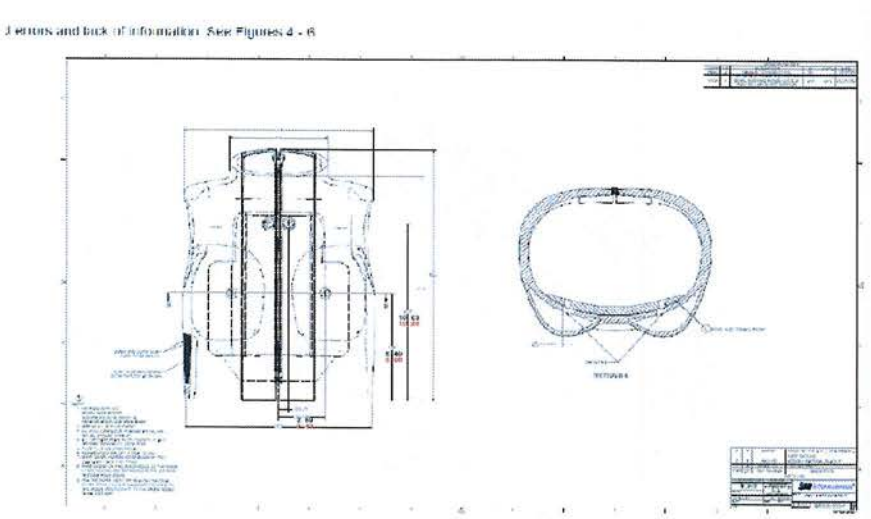
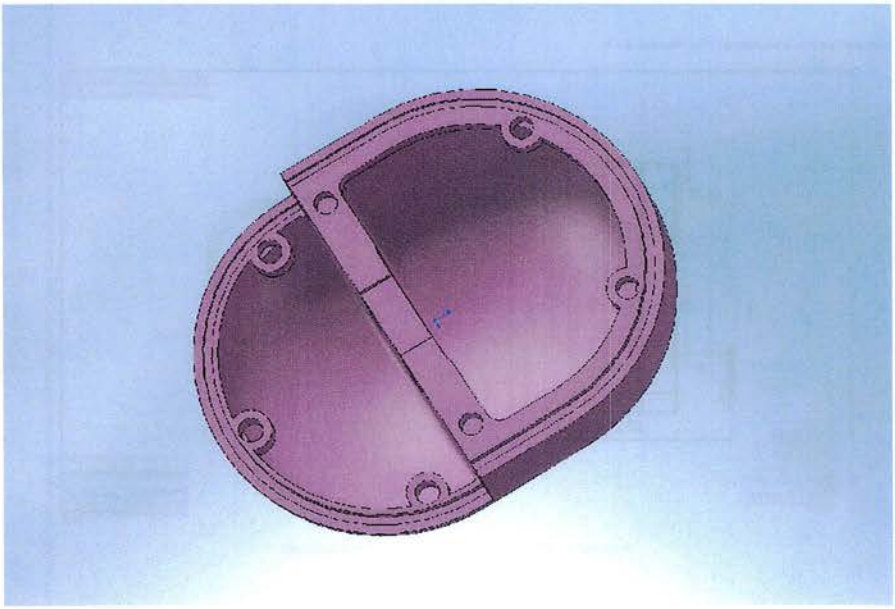


FIGURE 4 - FRONT VIEW CHEST JACKET DRAWING

3D Model comparison

FMVSS226 Cast. Modification



FMVSS226 Modification

Thank You

JASTI Update
dummy specification

ISO/TC22/SC12/WG5
2013/11/14 Troy
JASTI Co., Ltd.

JASTI

Information from Others

- WorldSID50 development
- Hybrid-III Rib Development update.
- EuroSID-2, ES-2re Abdominal Insert

World SID 50

	Sep.l	Oct.	Nov.	Dec.	Jan.2014.	Feb..	Mar.
Head ass'y	3D review	Mold refined Production	Repeat test And refine				
Neck Ass'y	Test and Review	Rubber Spec confirmed.	Production	Repeat test			
Shoulder Rib Chest Rib Abdominal Rib	Simulation by different material. Rib proto production	Single rib test New Rib set from test Results	Damping material study Waiting for New IR-TRACC	Full body test Stability test			
Pelvis Ass'y		Two different models	Full body test	Production and test			
Others			Evaluation test			Summary	

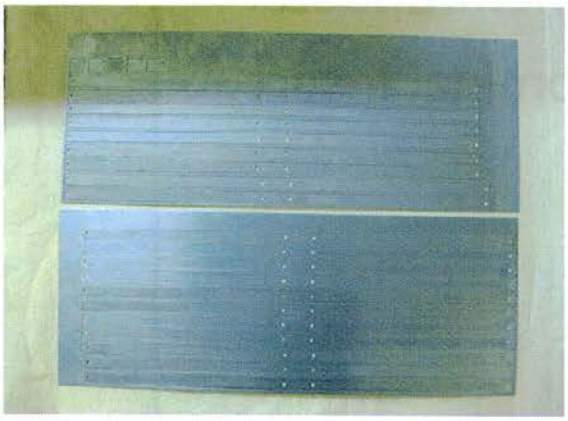
- New IR-TRACC sensor required for further full body test.

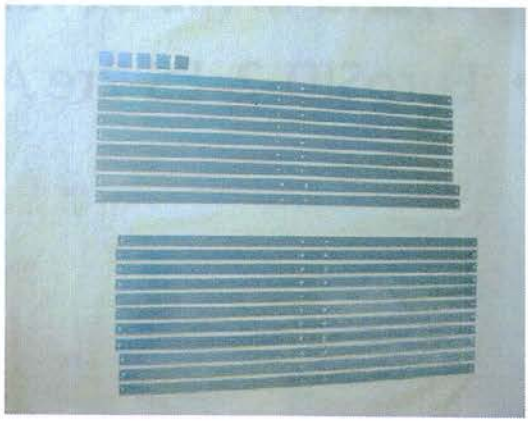
Hybrid-III Rib Development update

To meet High/Low speed impact certification.

(1).Reviewed Rib steel sheet . (within specification)

(2).Cut into as precise width with small test piece



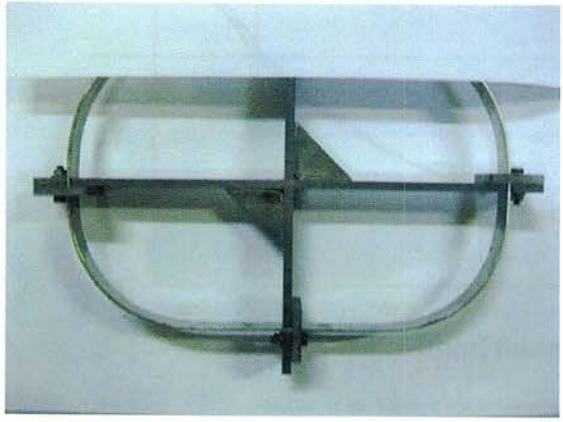


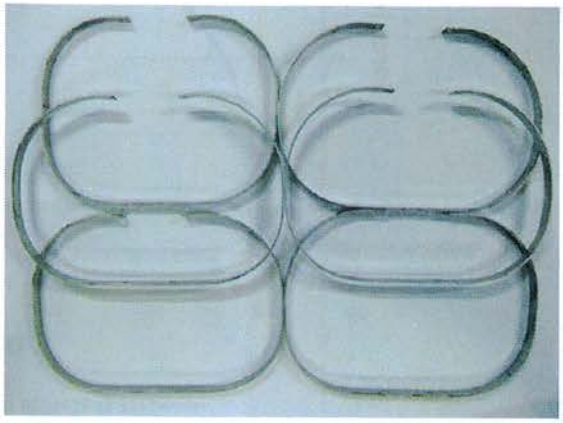
Hybrid-III Rib Development update

To meet High/Low speed impact certification.

(3).Heat Treatment with fixed jig to take off inner stress.
(No Spring back)

(4). Check shape & hardness
No twist,
H-III 50 HRC44-46
H-III 5F HRC44-48



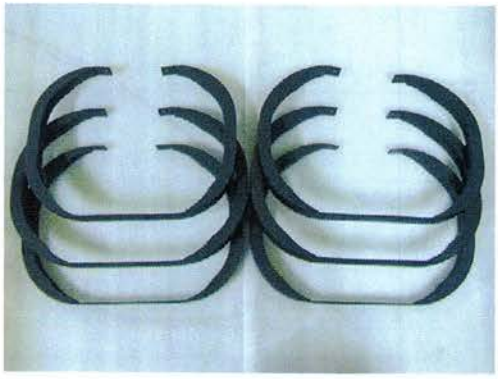


New Rib set

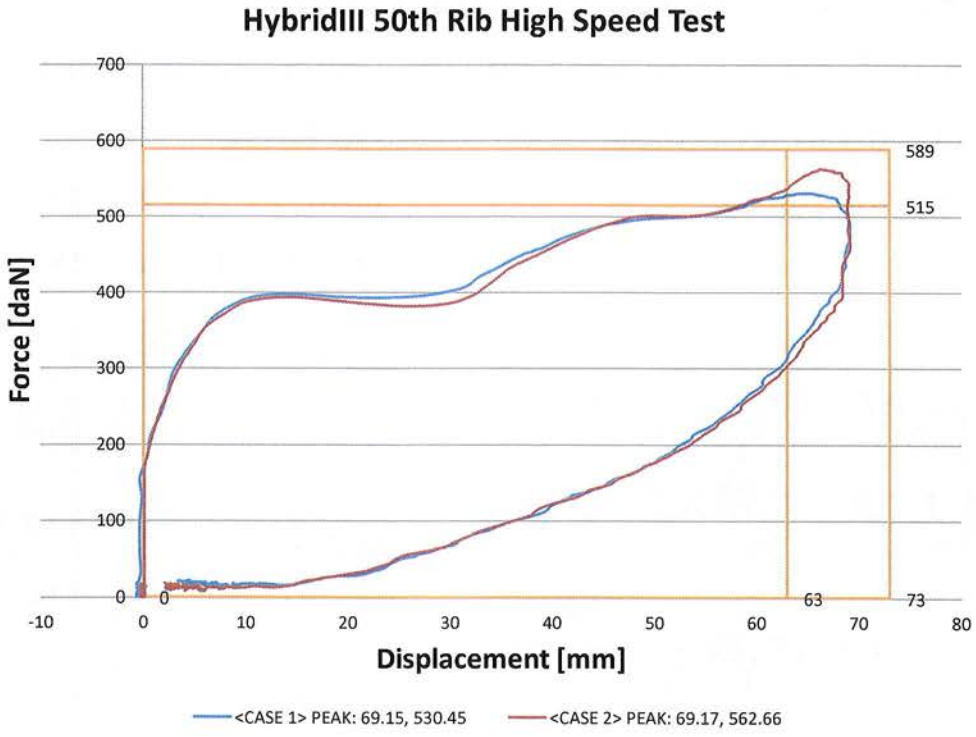
To meet High/Low speed impact certification.

(5).New damping material
1set (No.1-No.6)

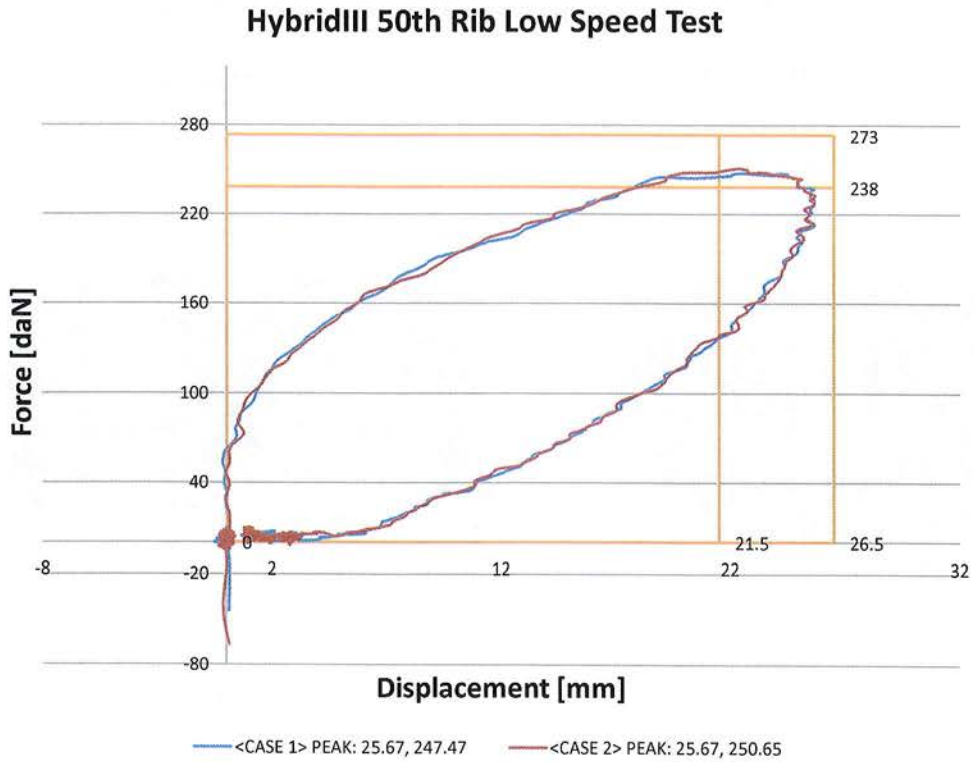
(6). Rib Assembly set



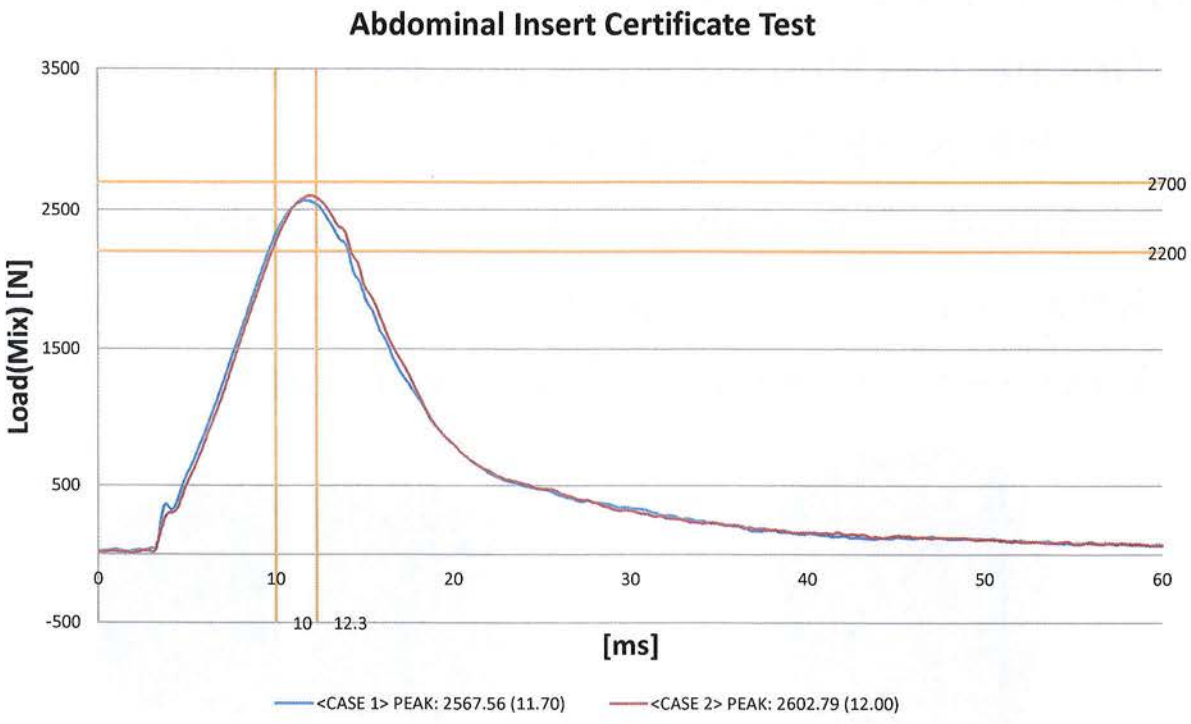
Hybrid-50th Rib High/Low speed test



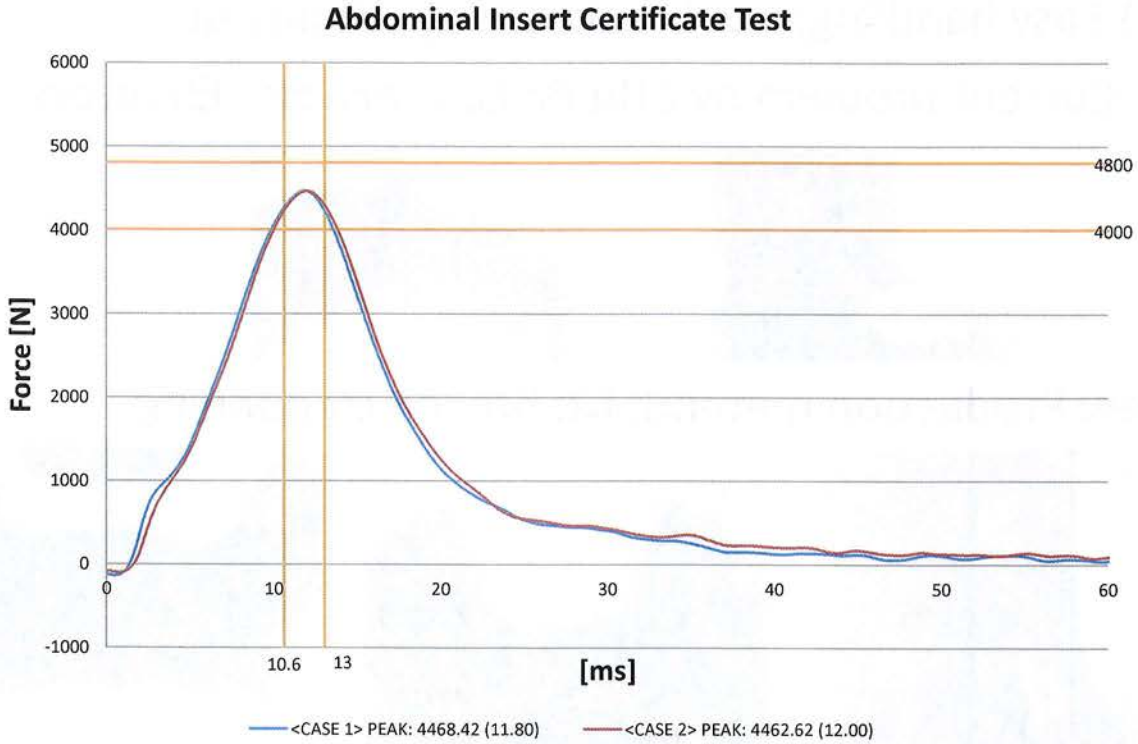
Hybrid-50th Rib High/Low speed test



Abdominal Insert Certification Test



Abdominal Insert Certification Test



EuroSID-2, ES-2re Abdominal Insert

(1).To meet the requested corridor.

Original specified materials; unstable results

Main block; Polyurethane

Ballast ; Polyurethane + Lead or equivalent

New materials; (No Lead by Environmental reason)

Vinyl + Polyurethane

Polyurethane EL

EuroSID-2, ES-2re Abdominal Insert

(2).Easy handling; not breakable by taking out.

Current problem by others; Easy crack、Broken

New Production method; No broken by opening

Thank You

North America Market Activities

Presented by:

Randy Kelly

February 12, 2014

JASTI-UTAMA
17600 S. MAIN ST, STE 407 GARDENA, CA 90248

Agenda

- USA Market
  - NHTSA
    - Q3s
    - WorldSID-5F
    - WorldSID-50M
  - IIHS
  - 2013 Sales Activity
  - 2014 Sales Projection

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s 3-Year-Old Side Impact Dummy Notice of Proposed Rulemaking (NPRM) issued November 21, 2013

- The Q3s ATD is built on the platform of the standard Q3 dummy that is part of the Q-series of child dummies developed in Europe to replace the P-series.
- The Q3s weighs 14.5 kg (32.0 lb) and the 539 mm seated height of the dummy is representative of a 50th percentile 3-year-old child.
- The NPRM proposes to incorporate specifications and qualification requirements for the Q3s into 49 CFR Part 572, "Anthropomorphic Test Devices." The Q3s would be specified in a new subpart "W".

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s 3-Year-Old Side Impact Dummy Notice of Proposed Rulemaking (NPRM) issued November 21, 2013 (con't)

- The agency plans to use the Q3s to test child restraint systems to new side impact performance requirements which NHTSA will propose to adopt into the Federal Motor Vehicle Safety Standard for child restraint systems by way of a separate NPRM.
- The agency plans to propose adding a side impact test to FMVSS No. 213, one in which child restraint systems (CRSs) sold for children weighing up to 18 kilograms (kg) (40 pounds (lb)) must protect the child occupant in a dynamic sled test simulating a vehicle-to-vehicle side impact.

National Highway Traffic Safety Administration (NHTSA)

- **Q3s 3-Year-Old Side Impact Dummy Notice of Proposed Rulemaking (NPRM) issued November 21, 2013 (con't)**
  - The agency is considering using the Q3s to measure the risk of head injury by way of a head injury criterion (HIC) (computed within a specified timeframe, e.g., 15 millisecond (ms) (HIC15), and the risk of chest injury using thorax deflection (IR-TRACC) as a criterion
  - NHTSA is satisfied with the overall biofidelity of the Q3s and have found that it exhibits repeatable and reproducible performance in CRS side impact sled testing and in component-level qualification testing

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Design**
  - **Head** – high modulus fiberglass with flesh molded to the skull
    - Featureless face and removable skull cap
    - Frequency response tested and demonstrated noise was successfully attenuated
    - Biofidelity tested in lateral and frontal (drop test) impact conditions
  - **Neck** - 3 natural rubber segments bonded to aluminum plates with an internal cable assembly
    - Develop a neck that meets lateral and frontal biofidelity
    - Cable located near back of the neck
    - Accepts upper and lower 6-channel load cells

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s Design Continued

- **Shoulder** – design intent was to improve the compliance and durability while maintaining proper anthropometry and mass distribution. Flexible rubber shoulder developed to meet design goal.
  - Shoulder component consists of high strength aluminum parts that attach at the sternum, shoulder joint, and spine of the dummy
  - The shape of the rubber forms the external features of the scapula and clavicle and provides a surface for the seat belt routing
  - The joint itself consists of a ball and socket in order to simulate the humerus scapula joint, the ball on the shoulder and the socket integral to the upper arm bone
  - The joint is suspended between the thoracic spine and the sternum on a D-shaped rubber component
  - A string potentiometer is built into the shoulder assembly to measure the lateral deflection of the shoulder socket joint relative to the spine
  - Shoulder biofidelity evaluated using ISO 9790 shoulder test 1, scaled as suggested by Irwin et al. (2002)

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s Design Continued

- **Thorax** - ribcage consists of a 1-piece urethane ribcage with a bonded PVC outer skin layer
  - The shape, contour and thickness of the ribcage have been changed to provide improved lateral compliance
  - The ribcage is attached to an aluminum thoracic spine that connects the rubber lumbar spine and the shoulder-neck complex
  - Neoprene suit fits over the torso
  - An IRTRACC displacement sensor measures lateral displacement between the side of the ribcage and the thoracic spine
  - To assess the biomechanical performance of the thorax, the ribcage was impacted using the 1.7kg pendulum. The impact angle was 90 degrees from the frontal plane at 4.3m/s centered on the IRTRACC rib mounting screws

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s Design Continued

- **Abdomen** - abdomen is the same component used on the Q3 dummy
  - Consists of a PVC skin filled with urethane foam (similar to other ATD's)
  - Fits into a cavity formed by the ribcage on top and the pelvis assembly on the bottom
  - NHTSA assessed the biofidelity of the abdomen in an oblique pendulum impact using probe force targets established by TNO

National Highway Traffic Safety Administration (NHTSA)

❑ Q3s Design Continued

- **Pelvis** – the pelvis has two (2) parts
  - A pelvic bone casting made of a zinc alloy encased within a molded polyurethane flesh
  - The hip cups and femur heads are hardened aluminum
  - The H-point of the dummy is covered by the flesh of the upper leg
  - The upper leg consists of a steel reinforced urethane femur with a hollow PVC flesh shape that is filled with soft silicone rubber
  - The hip joint socket in the pelvis assembly is allowed to deflect inwards a maximum of 6mm. A cylindrical rubber buffer provides the spring force and preload for the hip socket. After 6mm of hip socket deflection a plastic hard stop limits further inward movement of the hip
  - Biofidelity corridors for lateral pelvic pendulum impact are described in Irwin et al. (2002)

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Head Drop Test**
    - Head must respond with peak, resultant acceleration between: 250 g, and 297 g when dropped from 376 mm height such that the forehead lands onto a flat rigid surface
    - Head must respond with peak, resultant acceleration between : 113 g and 140 g when dropped from a 200 mm height such that the side of the head lands onto a flat rigid surface

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Neck Pendulum Tests**
    - 4.7 m/s in **frontal flexion**, at between 70 degrees and 82 degrees occurring between 55 ms and 63 ms from time zero and decaying back to the zero angle between 50 ms and 54 ms after the peak rotation; the value of the maximum moment must be between 41 N-m and 51 N-m occurring between 49 ms and 62 ms from time zero
    - 3.8 m/s in **lateral flexion**, at between 77 degrees and 88 degrees occurring between 65 ms and 72 ms from time zero and decaying back to the zero angle between 63 ms and 69 ms after the peak rotation; the value of the maximum moment must be between 25 N-m and 32 N-m occurring between 66 ms and 73 ms from time zero
    - 3.6 m/s in **torsion**, at between 75 degrees and 93 degrees occurring between 91 ms and 113 ms from time zero and decaying back to the zero angle between 84 ms and 103 ms after the peak rotation; the value of the maximum moment must be between 8 N-m and 10 N-m occurring between 84 ms and 103 ms from time zero

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Shoulder Impact**
    - The shoulder exposed to a pendulum impact at 3.6 m/s is to exhibit a peak shoulder deflection between 16 mm and 21 mm, and a peak resistance force between 1,240 N and 1,350 N

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Thorax Impact**
    - The thorax qualification tests are very similar to the SAE test used to assess lateral thorax biofidelity. For qualification, however, the test is conducted two ways: Without arm interaction (as in the SAE test) and with the arm attached such that the impact probe strikes the upper arm. Both tests utilize a lateral impact with a 3.8 kg probe
    - At 3.3 m/s, without arm, is to exhibit a peak thorax deflection between 24 mm and 31 mm, and a peak resistance force between 620 N and 770 N
    - At 5.0 m/s, with arm attached, is to exhibit a peak thorax deflection between 23 mm and 28 mm, and a peak resistance force between 1,380 N and 1,690

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Lumbar Tests** - Lumbar testing consist of two types of pendulum tests. A frontal test and a lateral test.
    - For both tests, the lumbar spine element containing the flexible column is removed from the dummy, similar to the neck qualification tests.
    - Lumbar tests are conducted using the same Part 572 neck pendulum and headform device utilized in the neck qualification tests
    - The frontal and lateral pendulum tests are conducted at the same impact speed of 4.4 m/s and specify the same pendulum impulse

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Lumbar Tests Con't**
    - In frontal flexion, at not less than between 48 degrees and 57 degrees occurring between 52 m/s and 59 m/s from time zero and decaying back to zero angle between 50 m/s and 56 m/s after the peak rotation; the value of the maximum moment must be between 78 N-m and 94 N-m occurring between 46 m/s and 57 m/s from time zero
    - In lateral flexion, at not less than between 47 degrees and 59 degrees occurring between 50 m/s and 59 m/s from time zero and decaying back to zero angle between 47 m/s and 59 m/s after the peak rotation; the value of the maximum moment must be between 78 N-m and 97 N-m occurring between 46 m/s and 57 m/s from time zero

National Highway Traffic Safety Administration (NHTSA)

- **Q3s Performance Specifications (Certification Tests)**
  - **Pelvis Impact**
    - A lateral impact with the 3.8 kg probe at 4.0 m/s is used to test the pelvis. This test protocol is very similar to the SAE biofidelity test. The pelvis exposed to a pendulum impact at 4.0 m/s is to exhibit a peak pubic load between 700 N and 870 N, and a peak force measured by the pendulum between 1570 N and 1810 N
  - **Abdomen**
    - NHTSA has not included a qualification test aimed specifically at the Q3s abdomen. The agency tentatively believes that any non-uniformity in stiffness due to the absence of a qualification requirement for the abdomen would have an insignificant effect on the overall kinematics of the dummy in a side impact test

WorldSID-50M Update

- ISO/TC22/SC12/WG5/WorldSID Task Group N 645 Document Summary
  - **ATD Application**: The WorldSID 50th percentile male dummy can be used to assess vehicle performance in near side and far side impacts by vehicles, moving deformable barriers (MDB), and poles
  - **Features of WS-50M**: A world-harmonized mid-size adult male with over 170 data channels available.
    - In-dummy data acquisition system (DAS) is available.
    - Designed to have biofidelic response in impacts up to ±30° from pure lateral.
    - Significantly improved biofidelity as compared to existing side impact dummies. (Louden, ESV 09-0296, 2009. Stricklin, "Biofidelity Analysis of WorldSID and ES2-re", Government / Industry Meeting, Feb, 2009)

WorldSID-50M Update

- ISO/TC22/SC12/WG5/WorldSID Task Group N 645 Document Summary
  - **Status of WorldSID 50th Development & Documentation**
    - Over 70 dummies sold Worldwide as of Oct. 2013
    - Excellent Repeatability & Reproducibility (Wismans, EEVC WG12, 2009)
    - "The overall WorldSID dummy durability is good" in vehicle tests with both MDB and Pole (Louden, ESV 09-0296, 2009)
    - The manufacturing drawing package is available from the ISO WorldSID Task Group
    - ISO 15830 document parts 1 through 4 (2nd revision) are available
      - part 1 – terminology and rational
      - part 2 – mechanical systems
      - part 3 – electronic subsystems
      - part 4 – users' manual
    - ISO Seating Procedure (ISO 17949) was completed by the ISO seating procedure task group
    - Generic DAS specification to allow introduction into US regulation is under development.
    - Injury risk curves for the WorldSID 50th are available and have been published ISO TR 12350

WorldSID-50M Update

- ISO/TC22/SC12/WG5/WorldSID Task Group N 645 Document Summary
  - **Issues Resolved**
    - A manufacturing defect in the pelvis bone (curing time) was identified and corrected. Current parts no longer have this issue
    - Some original materials are no longer in production and alternates have been identified, tested and are in production. The WorldSID and other ATDs may be faced with material changes in the future and will need to be resolved. This has been done successfully in the past
    - The task group is currently revising verification corridors; similar to other production and regulated dummies that have had their corridors changed. Larger populations in the field generally can be used to improve the corridors

WorldSID-50M Update

- ISO/TC22/SC12/WG5/WorldSID Task Group N 645 Document Summary
  - **Ongoing investigations**
    - A single rib verification test is being developed as an optional lab inspection test. It is not necessary to regulate this test to insure ATD performance. It is a tool to allow labs to minimize rib replacements.
    - Possible interference between the pelvic bone and the Sacro Illiac load cell has been identified during severe loading. The task group is currently identifying if this is affecting the Sacro Illiac and lumbar recorded loads. These loads are currently not planned for injury assessment. The pubic loads which are proposed for injury assessment are unaffected.
  - **Next Meeting – March 27th in Germany**

WorldSID-5F Update

- WorldSID 5th TEG Meeting Minutes (November 2013) Summary
  - **Dummy design changes and modifications**
    - **Neck** – redesign of neck bracket to eliminate contact with load cell
    - **Shoulder** – load cell (new design) moved to outboard position. String pot still being considered for displacement measurement sensor. NHTSA would like to see linear pot
    - **Pelvis** – complete redesign in including bone, flesh, etc. to eliminate contact internally. Mass and maintaining biofidelity is critical.
    - Humanetics (HIS) reported that parts are still being produced and are not yet available for evaluation. HIS estimates that parts will be available for internal testing in February. Assuming positive results from HIS, parts will subsequently be made available to VRTC ASAP. HIS shared some early iliac wing and lumbar sample parts which were produced with a range of stiffness to allow for tuning of the biofidelity responses. xt
  - **Next Meeting – March 27th in Germany**

WorldSID-5F Update

- WorldSID 5th TEG Meeting Minutes (November 2013) Summary
  - **NHTSA/VRTC plans for Durability Testing** - similar to that which was performed in the Agency's SID-IIs evaluation. The proposed testing included both high-energy pendulum impacts and a number of MCW sled test conditions. D. Rhule noted that proposed sled testing matrix included two tests at 8.9 m/s and stated that VRTC had not yet determined if this impact speed was too severe.
  - **Biofidelity Testing** - VRTC's proposal for biofidelity testing, which included ISO-9790 and NHTSA test conditions for component level tests and full-body sled testing.
    - J. Jensen suggested that OSRP would likely repeat much of the ISO-9790 biofidelity tests; however, OSRP has not yet determined a final test matrix. K. Bortenschlager stated that PDB would be interested in durability and R&R testing, but does not plan to conduct any biofidelity testing. PDB would coordinate with other test labs to minimize duplication of efforts.

Insurance Institute for Highway Safety (IIHS) Activities for 2014

- Small Overlap Frontal Test
- Side Impact Testing (Far-side)
- Vehicle Compatibility (possible)
- Vehicle Avoidance

ARIES
INGENIERIA Y SISTEMAS, S.A.

ARIES PRESENTATION

JASTI end users meeting

February 12th, 2014

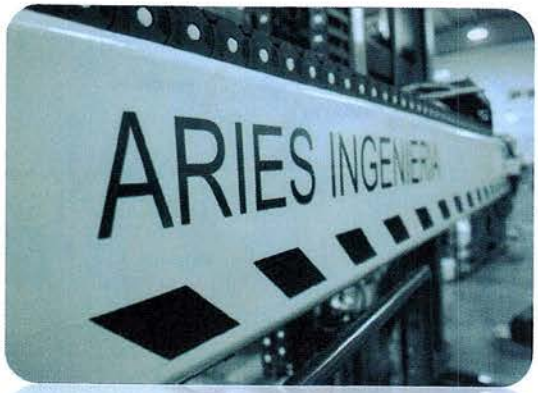
Aries Presentation JAPAN
Rev. 140207 v.1

ARIES
INGENIERIA Y SISTEMAS, S.A.

1.1 ABOUT ARIES

Founded in 1985, Aries is a world leader, independent, global and diversified engineering company. With headquarters in Madrid (Spain), offices in Miami (USA), Shanghai (China) and worldwide presence, Aries has a substantial background in the field of test systems.

Test systems projects all over the world have set Aries reputation as the leading engineering company.



Founded: 1985

Global presence

Certificated Quality: ISO 9001

R+D (2013): 2.6 M€

Financial classification: A1
D&B Inter. num.: 46-237-5783

Offices:
Madrid. Spain
Miami, FL. USA
Shanghai. China

1.2 VISION, MISSION AND OBJECTIVE

Vision:

To be the company of reference in the sectors where we operate, through technological leadership, efficiency, quality and excellence in the solutions we offer.

Mission:

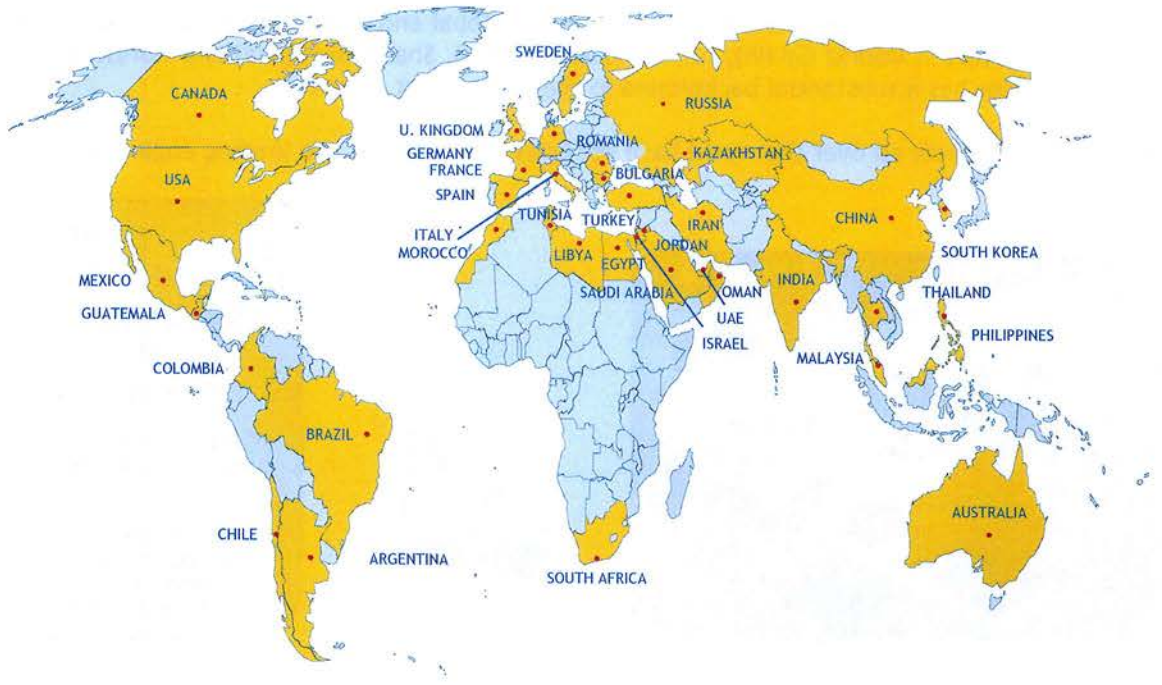
To satisfy customer needs all around the world, with efficient solutions that provide exceptional added value, using the most advanced technology and the best qualified team, meeting or exceeding the agreed functionality, quality, cost and deadline and receiving a fair compensation for the delivered value.

Objective

Aries' objective is profitable, strong and steady growth.

ARIES
INGENIERIA Y SISTEMAS, S.A.
1.General Aries overview

1.3 ARIES WORLD REFERENCES



1.4 BUSINESS UNITS

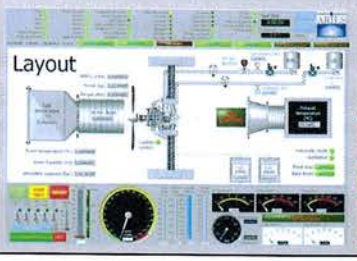
Energy

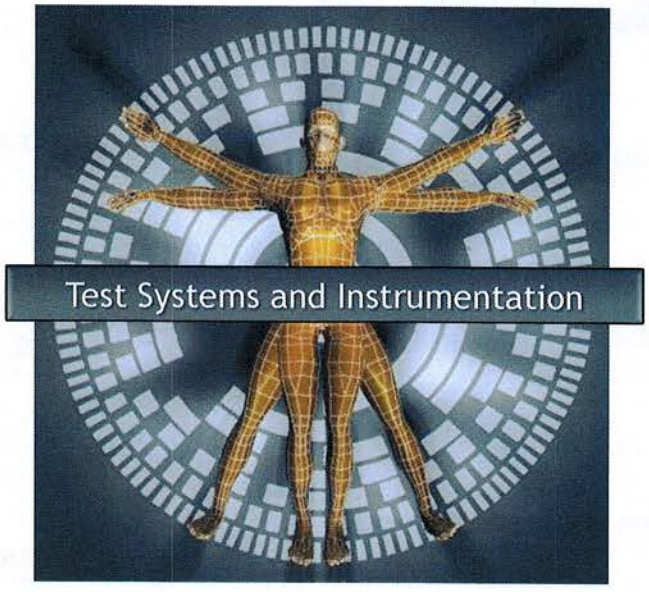
Development
Engineering
Construction
O&M

Test Systems

&

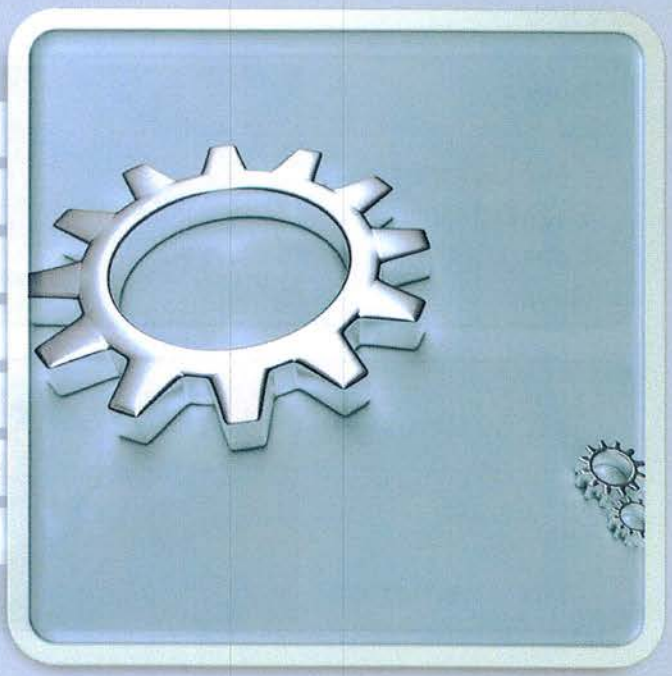
Instrumentation





Technological skills

- Electro-mechanical Design
- Servo-hydraulics systems
- Real time control loops
- Dynamic systems simulation
- Software Development
- Data measurement and analysis
- Civil works & AE definition



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2. Test Systems

Scope of supply

Operation Support

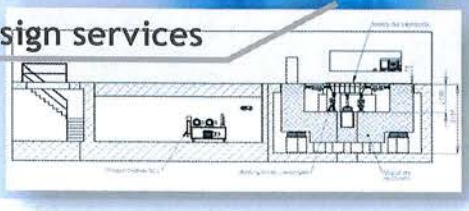
Commissioning & Training

Feasibility Studies

Turn-key supply

Supply

Design services



Production & Integration

Our products

- ✓ FULL SCALE CRASH TEST LABORATORIES
- ✓ CRASH SIMULATION TEST FACILITIES (SLED)
- ✓ HEAD RESTRAINT & SEAT STATIC LOADING TEST SYSTEM (R17, R25)
- ✓ ARIES' LAUNCHER FAMILY:
  - Universal Launcher
  - Lite Launcher
  - Compact Launcher
  - Double Launcher
- ✓ SEAT BELT ANCHORAGE TEST SYSTEM (R14, R17)
- ✓ ROOF CRUSH AND SIDE INTRUSION (FMVSS 214, 216)
- ✓ RESISTANCE OF SEAT BUSES
- ✓ PENDULUM FOR BUMPER TESTING
- ✓ AUTONOMOUS VEHICLE FOR ADAS TESTING (AVAT)
- ✓ AUXILIARY EQUIPMENTS

Awards

Let's talk about FUTURE

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GLOBAL SAFETY PERFORMANCE EVALUATION

testing

Best Crash Test Facility of the Year 2013

www.ariestesting.com

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INDEX

1. FROM INTEGRATED SAFETY TO GLOBAL SAFETY EVALUATION
2. ARIES GLOBAL SAFETY TEST LAB (GSTL)

ARIES
INGENIERIA Y SISTEMAS, S.A.

INDEX

1. FROM INTEGRATED SAFETY TO GLOBAL SAFETY EVALUATION
2. ARIES GLOBAL SAFETY TEST LAB (GSTL)

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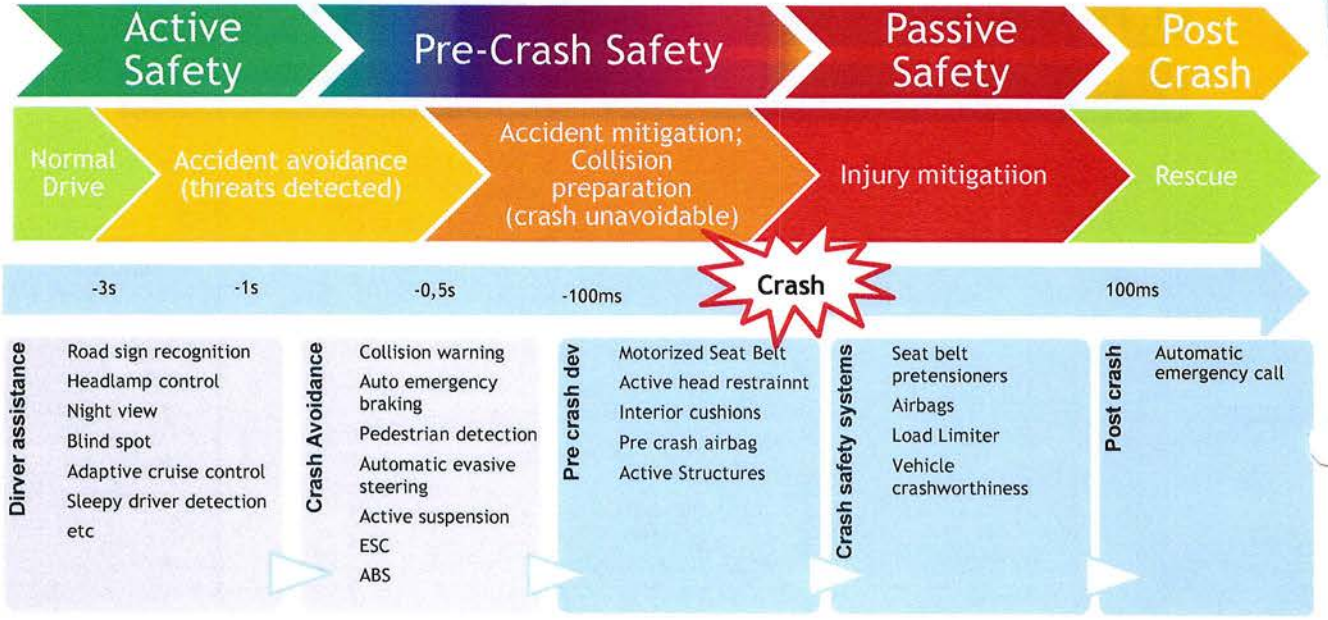
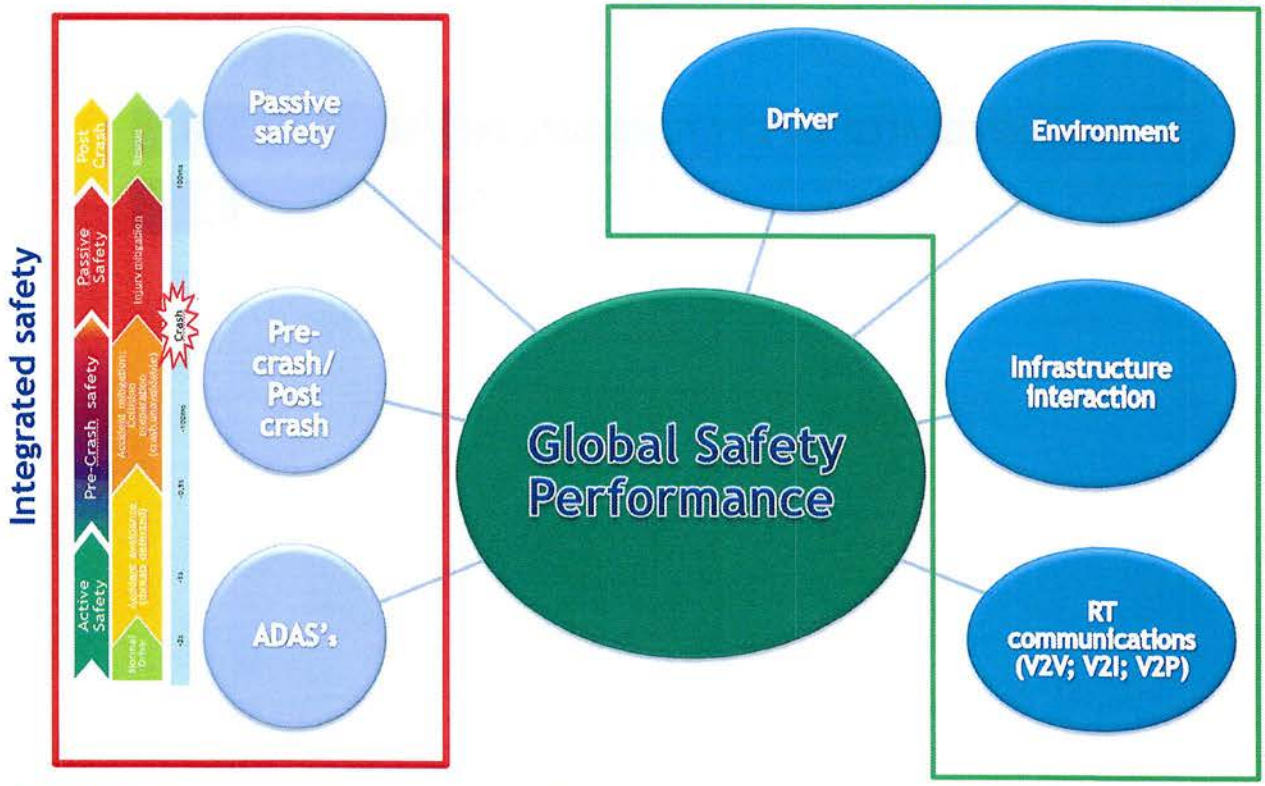
TRADITIONAL INTEGRATED SAFETY DIAGRAM



New factors of influence are introduced



ARIES
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INDEX

1. FROM INTEGRATED SAFETY TO GLOBAL SAFETY EVALUATION

2. ARIES GLOBAL SAFETY TEST LAB (GSTL)

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2. Aries global Safety Test Lab (GSTL)

Simulation Tests

- Environmental simulation Hall (ESH)
- Advanced Crash Simulation Sled (ACSS)

Full Scale Tests

- Dynamic Test Field (DTF)
- Integrated Safety Crash Test Lab (ISCTL)

ARIES GSTL is composed by 4 testing facilities

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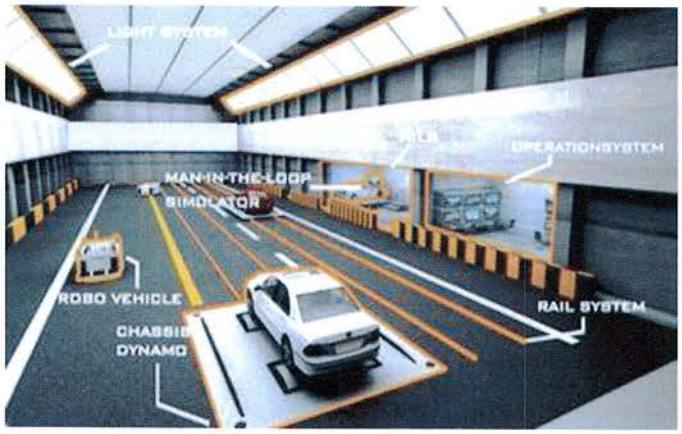
Environmental Simulation Hall

Environmental simulation Hall (ESH)



- Vehicle Under test running on Dyno bench or Driving simulator for H2iL testing

  - Large underroof hall with robotized balloon dummies (cars, pedestrian etc) in movement.

  - Movement of balloon dummies obtained by autonomous platform (AVAT) or by specific system integrated in the floor.

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Environmental Simulation Hall

Environmental simulation Hall (ESH)

ESH Simulation and testing of:

- V2V, V2I, V2P communication.

- ADAS's (Autonomous Brake, Lane keeping assist, Pre-crash Systems, Radar, Lidar, Ultrasound etc).

- Possibility of introducing real Driver (Human in the Loop) for checking real human behaviour in realistic but safe conditions.

ESH Key technologies: Synchronized Linear motors for movable objects, visual reality simulation, smart materials transparent to ADAS sensor, dyno integration with all elements for a realistic simulations, Communication.

Dynamic Test Field

DTF layout example

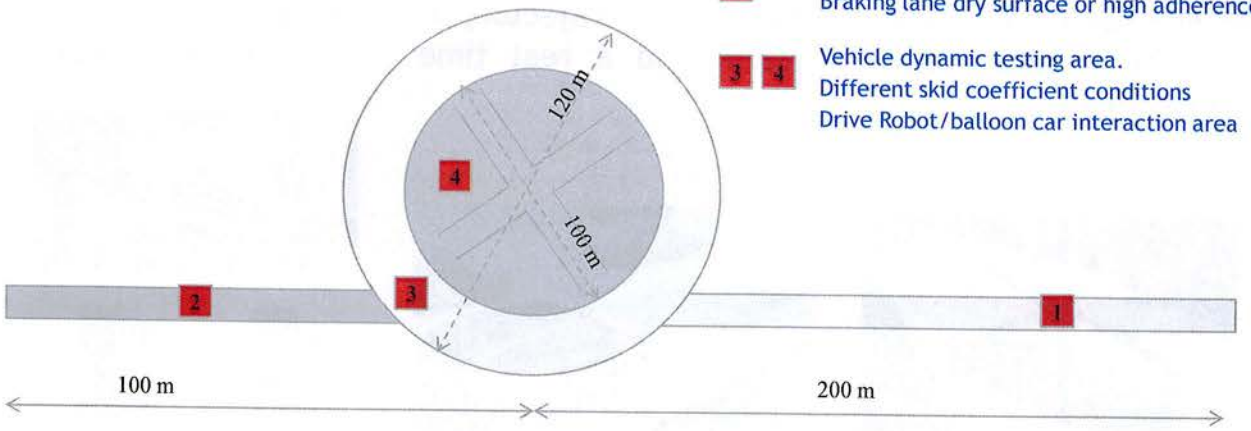
High drainage asphalt

Low or zero drainage floor (concrete or basalt)

1 Acceleration lane,
Braking lane wet surface or low adherence
Aquaplanning braking lane

2 Acceleration lane,
Braking lane dry surface or high adherence

3 4 Vehicle dynamic testing area.
Different skid coefficient conditions
Drive Robot/balloon car interaction area



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Dynamic Test Field (DTF)

Dynamic Test Field

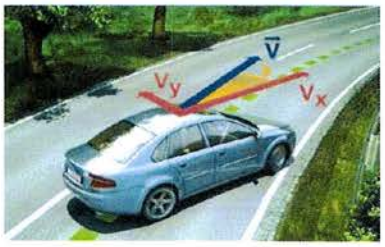
- **Real Testing of:**
  - Vehicle Dynamics, Handlying, Suspension set up etc.
  - V2V, V2I, V2P communication.
  - ADAS's real testing including predictive systems such as Side Crash prediction based on ESC sensors.

Dynamic Test Field

- **Maneuvers can be performed in a controlled and repetitive way by:**

  - Real drivers
  - Driving Robot
  - Autonomous vehicles with balloon dummies

Driving Robots and Aunonomous vehicles trajectory are sycronized in position and time by a accurate GPS system and a real time controller for maneuvers management.



Dynamic Test Field

- **DTF Key Technologies:**

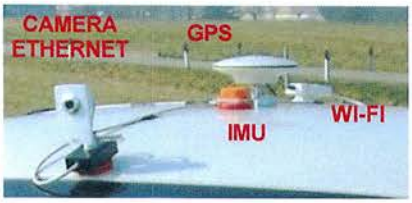
  - Autonomous vehicles for ADAS testing

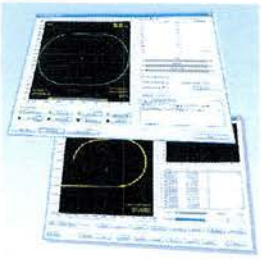
  - Driving Robot

  - Precise positioning system

  - Real time controlling

  - V2V communication and sync





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Advanced crash simulation sled

Advanced Crash Simulation Sled (ACSS)

- **ACSS**

Crash simulation system for testing passive safety component elements, in a more realistic way thanks to the use of advance features like:

- Pitching reproduction
- Yaw reproduction
- Intrusion simulations
- Pre-crash deceleration simulation (Pre-brake)
- Electric vehicles impact pulse reproduction

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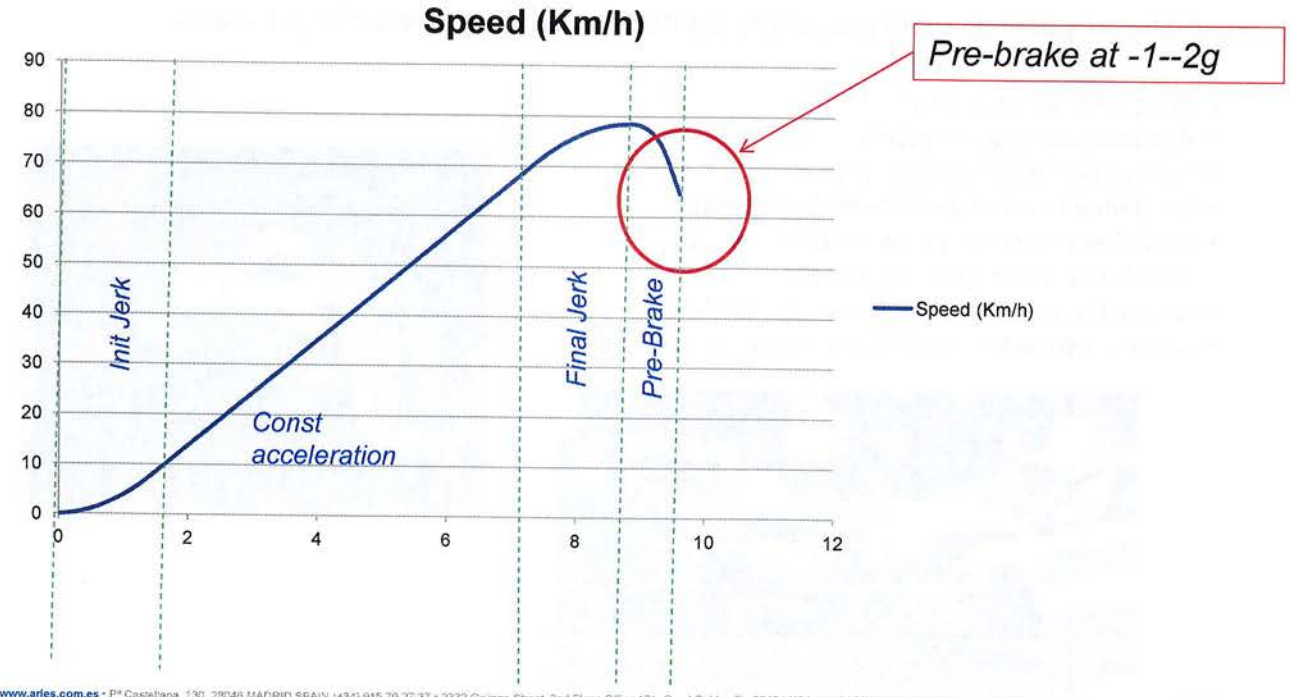
Advanced crash simulation sled

Advanced Crash Simulation Sled (ACSS)



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Advanced crash simulation sled

Advanced Crash Simulation Sled (ACSS)

- **ACSS Key Technologies:**

  - Advanced real time controlled servo hydraulics (for deceleration barrier)
  - Generation of high speed ruggedized carriage
  - HiL assistance for control system configuration set up...

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Integrated safety crash test lab

Integrated Safety Crash Test Lab (ISCTL)

- **ISCTL:**
  Crash test lab equipped with advance features that allows the testing of traditional passive safety aspects combined with active safety means:

  - Pre crash deceleration
  - Autonomous brake system
  - Interaction with other vehicles
  - Guidance less tracks (driven by robots)
  - Complex crash scenarios with car to car at arbitraries angles and speeds
  - Ready for electric vehicle safety handing
  - After crash Safety/Alerts communication checking

Integrated safety crash test lab

- ISCTL key technologies:

- Real time drive controls (single and combined synchronized)
- Driving robots
- Smart guidance systems
- Smart materials (electric vehicle ready, RA Pre crash deceleration

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Integrated Safety Crash Test Lab (ISCTL)

Integrated safety crash test lab

ISCTL Real Applications Examples:

- Crashworthiness (traditional passive safety testing) ⇨
- CTC crash different angles different speeds ⇨
- CTC crash between a car driven by robot against a car driven by traditional crash drive. ⇨
- Other enhancement of traditional crash tests ⇨
- Pre brake reproduction in traditional crash test facility ⇨
- Triggering of prediction sensors (i.e. ESC with side collision prediction) ⇨
- Present and future regulations of ADAS testing ⇨

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3.Contact

Thanks for your attention!!!

For additional information, please contact us:

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Integrated Safety Testing - Crashworthiness

CRASHWORTHINESS; OCCUPANT PROTECTION

- Frontal/Offset/Small Overlap/Pole
- Side /Rear/Pole
- Bumper test
- Rollover test: FMVSS 208
- Rollover test: Slope, Curb/Soil Trip, Cork screw
- Car-to-Car (Frontal, Rear, Angle, Small Overlap)
- Electrical Vehicles/Hybrid Vehicles

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Integrated Safety Testing - Crashworthiness

Angular Car-to-Car Crash Test

Frontal Impact Crash Test

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Integrated Safety Testing - Crashworthiness

Videos Full Scale Crash Test Facility

INDEX

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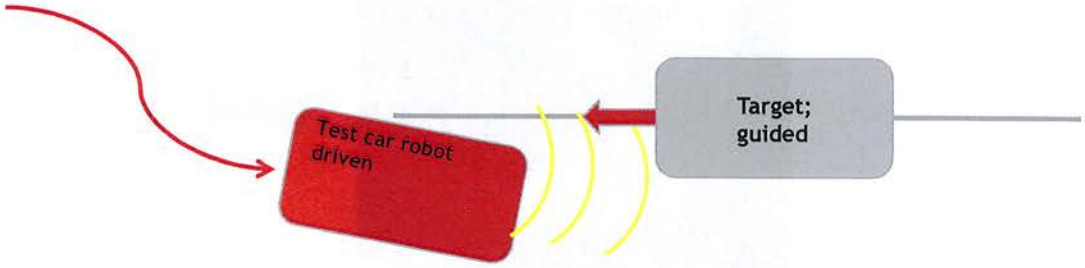
SYNERGIES WITH DRIVING ROBOT

The control system of a traditional crash lab can integrate the control of a driving **robot by time syncronization of the position of the two vehicles.**

This allows several enhanced safety testing investigating the interaction of 2 vehicles when one of the two has a straight trajectory with high speed and position accuracy requirements:

- Car-to-Car with bullet car in bending trajectory hitting a target car traditionally towed.



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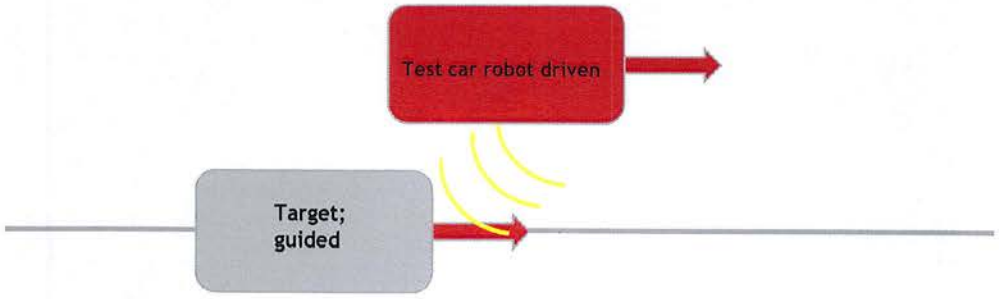
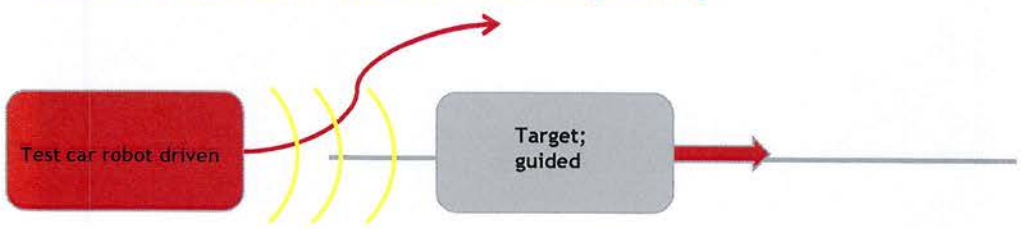
Enhacement of traditional Crash Labs

- Lateral approximation of two cars in parallel lanes:



- Rear car-to-car crash or automathic lane change testing.



INDEX

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Enhacement of traditional Crash Labs

IMPROVEMENTS IN TEST PROCEDURES

- Pre-crash pitching due to spontaneous braking

- Influence of rotational inertia of the engine
- Different friction coeficiente of the asphalt (or different material)
- Autonomous Emergency Braking/Collision mitigation testing
  - Frontal Impact
  - Rear Impact

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Integrated Safety Testing Autonomous Brake Evaluation

INTEGRATED SAFETY : ACTIVE & PASSIVE SAFETY TESTING

- While in the traditional crash test labs the crashworthiness is evaluated by fixing a target speed and an impact point, for the evaluation of the global effect of the Integrated Safety the **impact speed is NOT a target anymore**, but part of the result.
- The **speed must be accurate only in the moment in which the ADAS starts** to intervene to allow comparison between different vehicle and to have repeatable initial conditions. Then the **facility should allow the vehicle its free behaviour** under the only effect of the ADAS's which are active.
- The conditions of the **impact speed** (and in some cases the impact point), if happens, **will be influenced by the ADAS** and must be considered a result to evaluate.
- The **occupant injuries** under these condition will be the global result. (i.e. if an ADAS finally avoid the collision and there is no injury, this is the real result to be compared with other vehicles running with similar initial conditions).

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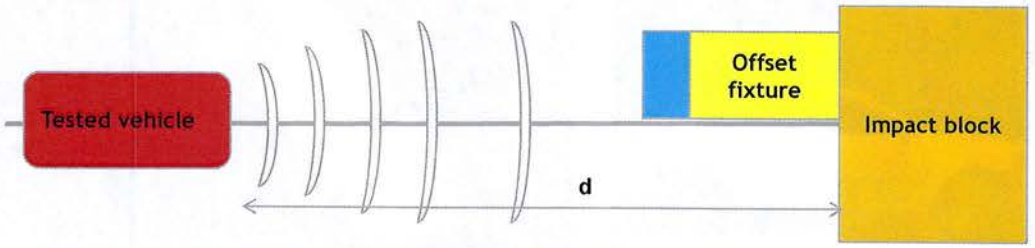
Autonomous Emergency Braking (AEB) or Collision Mitigation. Frontal Crash Testing in traditional crash labs:

Real examples are described below



At a distance "d" the vehicle running already at 90 Km/h (or higher speed) detects the barrier and starts braking

The impact is produced at a lower speed << 64 Km/h

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Integrated Safety Testing

Frontal Crash Testing in ARIES crash labs: Autonomous Emergency Braking or Collision Mitigation.

- For these ADAS a traditional crash test facility can be **easily retrofitted** for a correct testing however the **compatibility of detection sensors (Radar, Laser, Lidar, Video camera...) with the crash building must be verified.**
- The system must will allow to the **vehicle to brake on its own** and guarantee an optimum guidance during the deceleration phase, without interferring with the braking of the vehicle, but allowing the achievement of **an optimum lateral impact point accuracy.**
- The impact point accuracy is important in case of using impact fixtures such as the Offset R94
- The **control strategy of the crash facility is modified:**
  - The vehicle will be accelerated according to the "classical" ***control over speed.***
  - The sudden increase of **torque on the motor shaft** due to the vehicle braking **is detected** via Frequency converter and the control system switches from a ***Speed control*** **to a *Torque control*.**
  - From this moment only a minimum torque is mantained to keep the trolley under the car, and thus to guarrantee the guidance up to the impact point.

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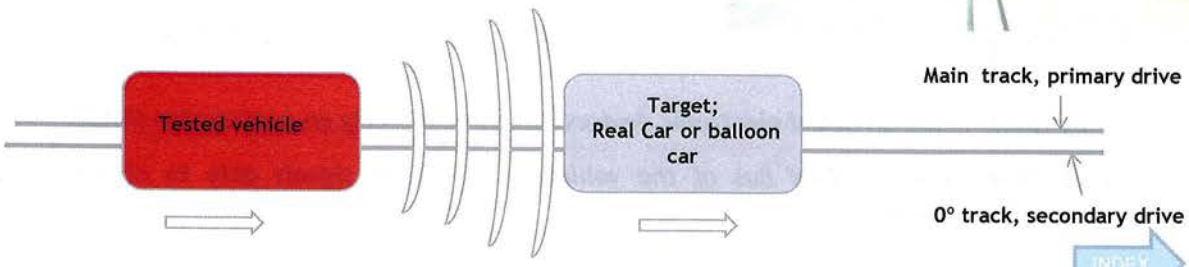
Rear Car-to-Car Crash Testing in ARIES crash labs: Autonomous Emergency Braking Collision Mitigation

- In ARIES laboratories with angular tracks and double drive it is possible to test the Autonomous Emergency Braking of a car approximating to another car (real or balloon) running at lower speed or under a controlled braking.
- The main track and the 0º tracks will be used for this purpose.
- The target vehicle will be towed at constant speed by one drive while the tested vehicle will run towed by the other drive with the same control strategy described for frontal crash.
- Different speed combinations can be choosen and the target vehicle can be also released and braked.



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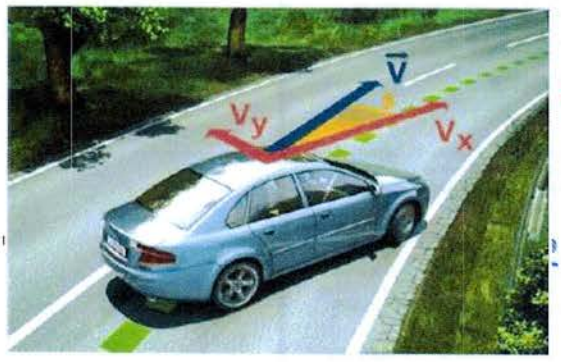
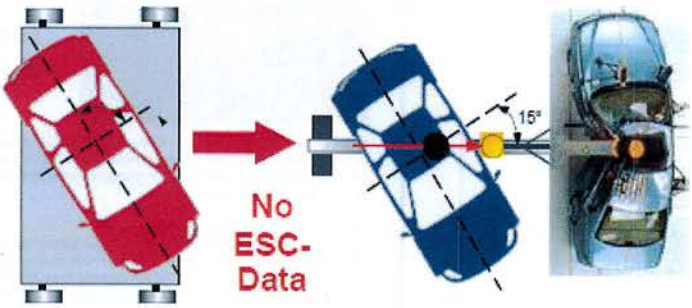
Pre-Crash systems triggered by predictive sensors

- The real situation that this kind of test want to reproduce is a lateral loss of adherence of a vehicle during a bend producing finally a lateral impact against a pole or a tree.
- Predictive sensors not always are available during crash tests in traditional labs.
- A common example is the FMVSS214 side pole.





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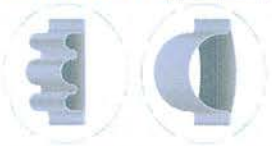
In modern vehicles, the ESC system on the top of the traditional stabilization functions, evaluates the information received from:

- Lateral velocity sensors (Vy)
- Side Slip angle (Beta)
- Lateral acceleration sensor (ay)

To establish the level of risk of side pole collision and thus it makes the decision of triggering several Pre-Crash devices such as:

- Active head restraints
- Pre-crash airbag
- Active structures
- Etc.

DAIMLER



In a Side pole FMVSS 214, the car is on a flying floor and the ESC data is not available.

In these kind of cases, in order to evaluate the real injuries it is necessary to trigger artificially the pre crash devices:

a) By taylor made on board electronic devices actuating directly on each device (HiL).

b) By feeding-in the CAN Bus of the vehicle with proper signals able to reproduce a triggering situation.

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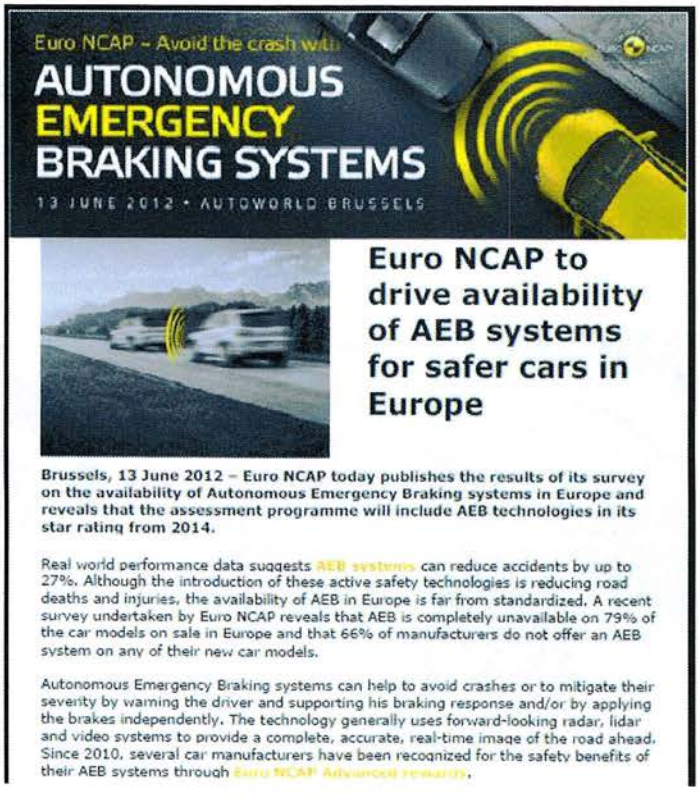
Integrated Safety Testing



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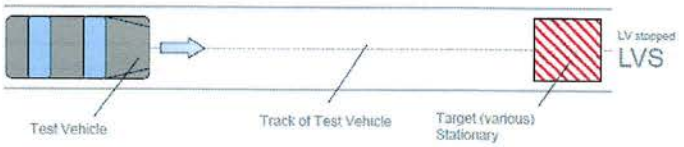
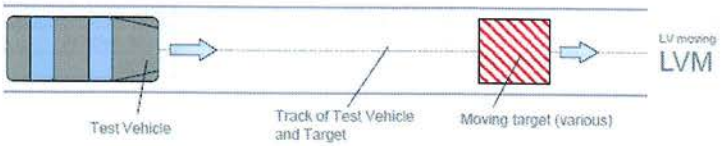
Euro NCAP - TEST PROCEDURE (2014 onwards)

1. Autonomous Emergency Braking City

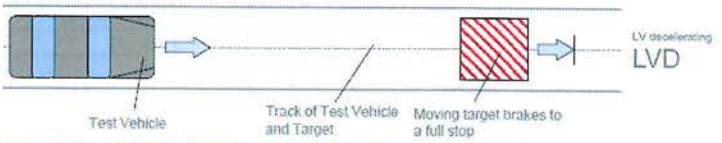
- LVS 30 kph to 80 kph (Incremental steps of 5kph) ⟹ 0 kph (Lead Vehicle Stopped)



- LVM 50 kph to 80 kph (Incremental steps of 5kph) ⟹ 20 kph (Lead Vehicle Moving)



- LVD 50 kph ⟹ 20kph (Lead Vehicle Decelerating of 2 and 6 m/s²) Distance 12 m and 40 m



Fitment Rate: 2014 (50%) ; 2015 (50%); 2016 (70%); 2017 (100%)

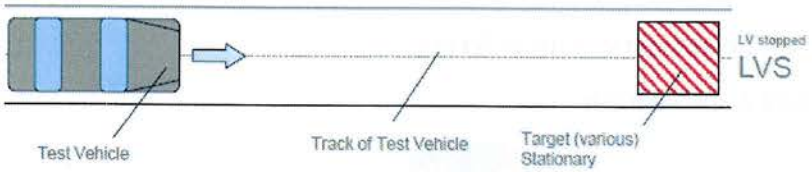
ARIES INGENIERIA Y SISTEMAS, S.A.

Integrated Safety Testing

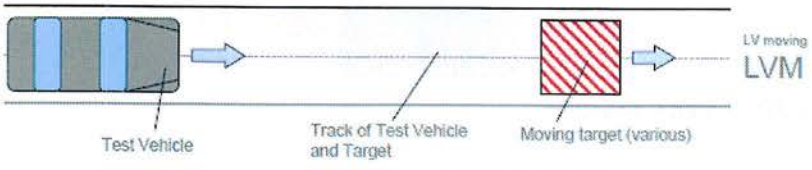
Euro NCAP - Rating Scheme (2013 - 2017): TEST PROCEDURES (Proposals)

VFSS Advanced Forward-Looking Safety Systems

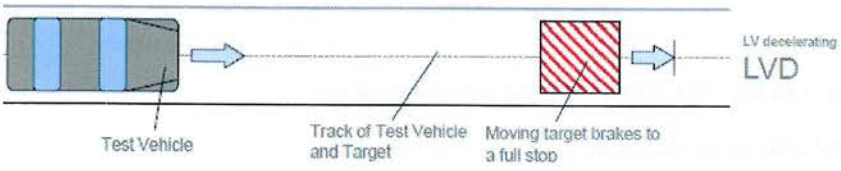
1. Forward Collision Warning (FCW)



Velocities [km/h]	v_0	$v_{rel.}$
Test vehicle	72	72
Target	0	



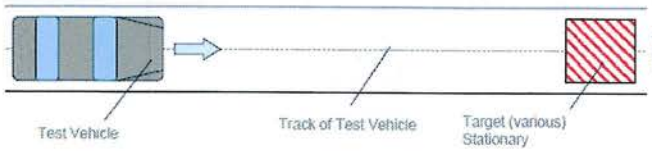
Velocities [km/h]	v_0	$v_{rel.}$
Test vehicle	72	40
Target	32	



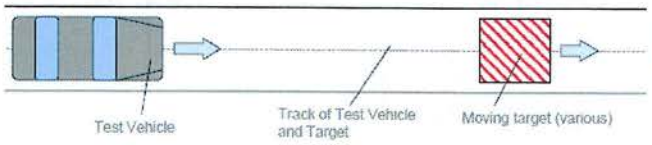
Velocities [km/h]	v_0	a_{LV}
Test vehicle	72	
Target	72	2.9m/s²

Euro NCAP - Rating Scheme (2013 - 2017): TEST PROCEDURES (Proposals)

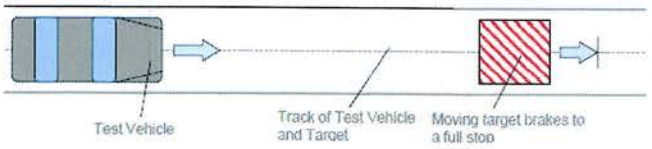
2. Autonomous Emergency Braking (AEB)



Velocities [km/h]	v_0	$v_{rel.}$
Test vehicle	25 50	25 50
Target	0	



Velocities [km/h]	v_0	$v_{rel.}$
Test vehicle	90	40
Target	50	

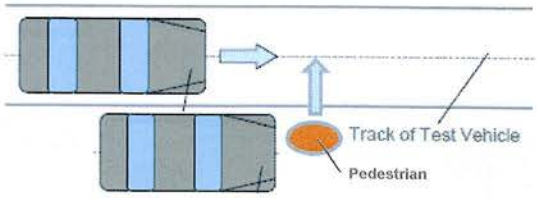


Velocities [km/h]	v_0	a_{LV}
Test vehicle	50	
Target	50	6.2m/s²

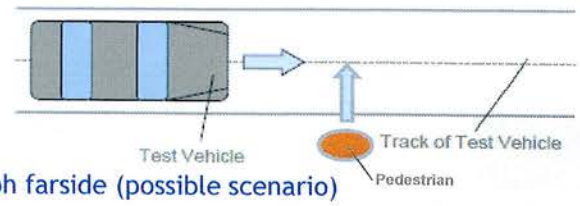
Euro NCAP - TEST PROCEDURE

1. Autonomous Emergency Braking Pedestrian

- Test vehicle from 10 to 60 kph (incremental steps of 5 kph)
  - ➢ Obstructed running child 8 kph nearside



  - ➢ Unobstructed adult walking 5 kph nearside

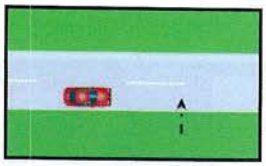


  - ➢ Unbostructed adult running 10 kph farside (possible scenario)
- Aiming point center of vehicle in all situations.

vFSS - Advanced Forward - Looking Safety Systems: TEST PROCEDURES (Proposals)

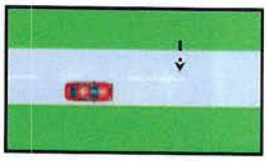
vFSS Advanced Forward Looking Safety Systems

S1



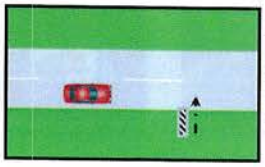
speed 45 - 50 km/h
braking of the car
adult crossing from the right
normal speed (5 km/h)
daylight

S2



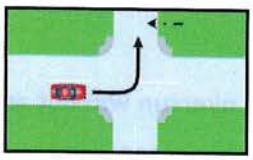
speed 55 - 60 km/h
braking of the car
child crossing from the left
running (8 - 10 km/h)
typical at night

S5



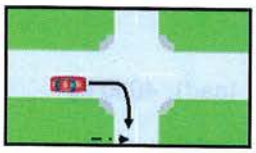
speed 45 - 50 km/h
child crossing from the right
running (8 - 10 km/h)
braking of the car
typical at night

S3



speed 20 - 25 km/h
adult crossing from the right
normal speed (5 km/h)
braking of the car

S4



speed 10 - 15 km/h
adult crossing from the right
normal speed (5 km/h)
braking of the car

Common Accident Scenarios Based on Analysis of UDV*

100% - All car to pedestrian frontal collisions

Scenario	S1	S2	S3	S4	S5
Share	32%	28%	18%	3%	7%

UDV* – Accident database of German Insurance Association

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Integrated Safety Testing

AUTONOMOUS VEHICLE FOR ADAS TESTING
AVAT

Lead Vehicle
or
Dummy Vehicle
or
Balloon Car

- Is the perfect solution for ADAS testing capable of carrying different crash targets **(Dummy Vehicle or Balloon cars, Dummy Pedestrians, Dummy Motorcycle, Dummy Bicycle, Misuse objects...**
- Designed for New Test Procedures (2014 EuroNCAP)

AVAT FEATURES:

- Designed to be **overrun** without any damage
- Dimensions (1550 x 1200 x 114 mm)
- Mass: < 130 kg
- Payload (static load): 4000 kg
- Max. Speed: 80 km/h
- Max. radius at Max Speed: 40 m
- Max. Acceleration: > 0,5g
- Max. controlled deceleration: > 0,7g
- Power: 8 kW
- Position and trajectory control based on DGPS

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ARIES PRESENTATION FMVSS-226

JASTI end users meeting

February 12th, 2014

Aries Presentation JAPAN
Rev. 140207 v.1

ARIES
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INDEX

1. EJECTION MITIGATON - FMVSS 226

2. ARIES EJECTION MITIGATION

ARIES
INGENIERIA Y SISTEMAS, S.A.

INDEX

1. EJECTION MITIGATON - FMVSS 226

2. ARIES EJECTION MITIGATION

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Ejection Mitigation - FMVSS 226

FMVSS 226 Regulation:

- Velocity: 16 km/h and 20 ± 0.5 km/h.

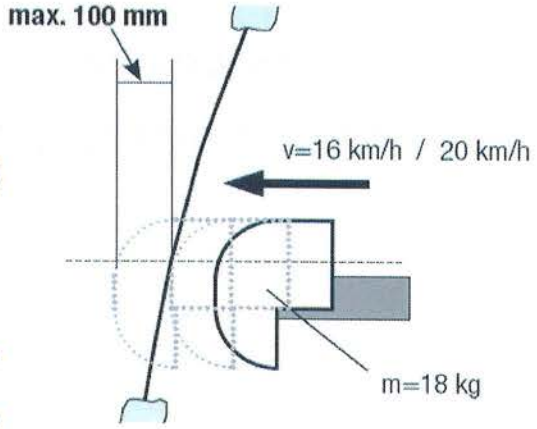
- Weight: 18 kg

- Head protection system (e.g. curtain airbags) must be fired before the impact:
  - At 20 km/h -> time delay 1,5 s
  - At 16 km/h -> time delay 6 s

-Tests are done without glazing or with pre-damaged glazing
  -pre-damage: perforation in a 75 mm grid pattern

- Friction Coefficient: 0,25 with 100 kg

- Max. Defection: 20 mm with 100 kg



-At up to 4 impact test location on each side window in the first 3 rows of seats the head excursion may not exceed 100 mm.

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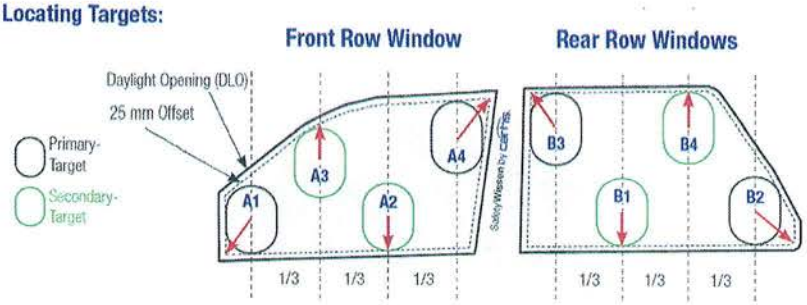
Ejection Mitigation - FMVSS 226

Locating Targets:



Steps	Front Row Window	Rear Row Windows SafetyWissen by cartis
1	Set Primary Target A1 in lower front corner	Set Primary Target B3 in upper front corner
2	Set Primary Target A4 in upper rear corner	Set Primary Target B2 in lower rear corner
3	Divide horizontal distance between A1 and A4 in thirds	Divide horizontal distance between B3 and B2 in thirds
4	Move A3 at the first third vertically upward	Move B1 at the first third vertically downward
5	Move A2 at the second third vertically downward	Move B4 at the second third vertically upward
6	Measure Distances D_x (horizontal) and D_z (vertical) of the target center points	
7	If D_x (A2 - A3) < 135 mm and D_z (A2 - A3) < 170 mm ⇨ Eliminate A3	If D_x (B1 - B4) < 135 mm and D_z (B1 - B4) < 170 mm ⇨ Eliminate B4
8	If D_x (A4 - A3) (or A2 if A3 was eliminated in step 7) < 135 mm and D_z (A4 - A3/2) < 170 mm ⇨ Eliminate A3/2	If D_x (B3 - B4) (or B1 if B4 was eliminated in step 7) < 135 mm and D_z (B3 - B4/1) < 170 mm ⇨ Eliminate B4/1
9	If D_x (A4 - A2) (or A3 if A2 was eliminated in step 8) < 135 mm and D_z (A4 - A2/3) < 170 mm ⇨ Eliminate A2/3	If D_x (B2 - B1) (or B4 if B1 was eliminated in step 8) < 135 mm and D_z (B2 - B1/4) < 170 mm ⇨ Eliminate B1/4
10	If D_x (A1 - A4) < 135 mm and D_z (A1 - A4) < 170 mm ⇨ Eliminate A4	If D_x (B3 - B2) < 135 mm and D_z (B3 - B2) < 170 mm ⇨ Eliminate B3
11	If only 2 targets remain: Measure absolute distance D the center points of the targets	
12	If D > 360 mm, set additional 3rd target on the center of the line connecting the targets	
13	If less than 4 targets remain, repeat steps 1-12 with the impactor rotated by 90 degrees. If this results in a higher number of targets use the rotated targets.	
14	If no target is found rotate the impactor in 5 degree steps, until it is possible to fit the impactor in the DLO-offset. Then place the center of the target as close to the geometric center of the DLO as possible.	

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INDEX

1. EJECTION MITIGATION - FMVSS 226

2. ARIES EJECTION MITIGATION

ARIES
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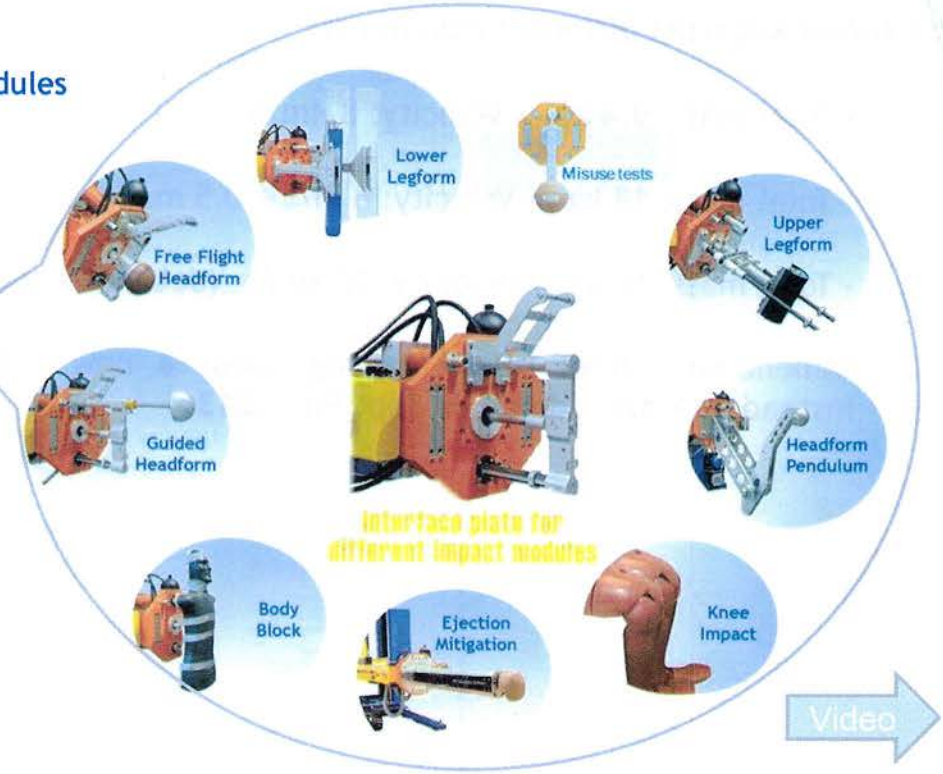
ARIES Ejection Mitigation

Universal Launcher modules



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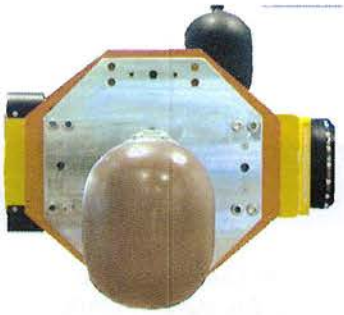
ARIES Ejection Mitigation

Technical features:

- Velocity: Up to 32 km/h ± 0.02 km/h.
- Weight: 6,8 kg; 13,5 kg; 18 kg; 22 kg
- Light guidance: 6,8 kg to 15 kg
- Heavy guidance: 15 kg to 22 kg
- Friction coeficientent: Adjustable (min 0,15 with 100 kg).
- Total guidance 800 mm (target impact at 350 mm)
- Position accuracy 25um (0,025mm) Linear encoder



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Information from different customers:

- Total mass: 9.4 kg -> Velocity: 8.4m/s

- Total mass: 18 kg -> Velocity: 6 m/s ± 0.5 m/s

- Total mass: 18 kg -> Velocity: 16 km/h (delay of 7 seg).

-Amendment from NHTSA talking about a new velocity: 24 km/h instead 20 km/h - dated on Sept 9th, 2013


FEDERAL REGISTER

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3.Contact

Thanks for your attention!!!

For additional information, please contact us:

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