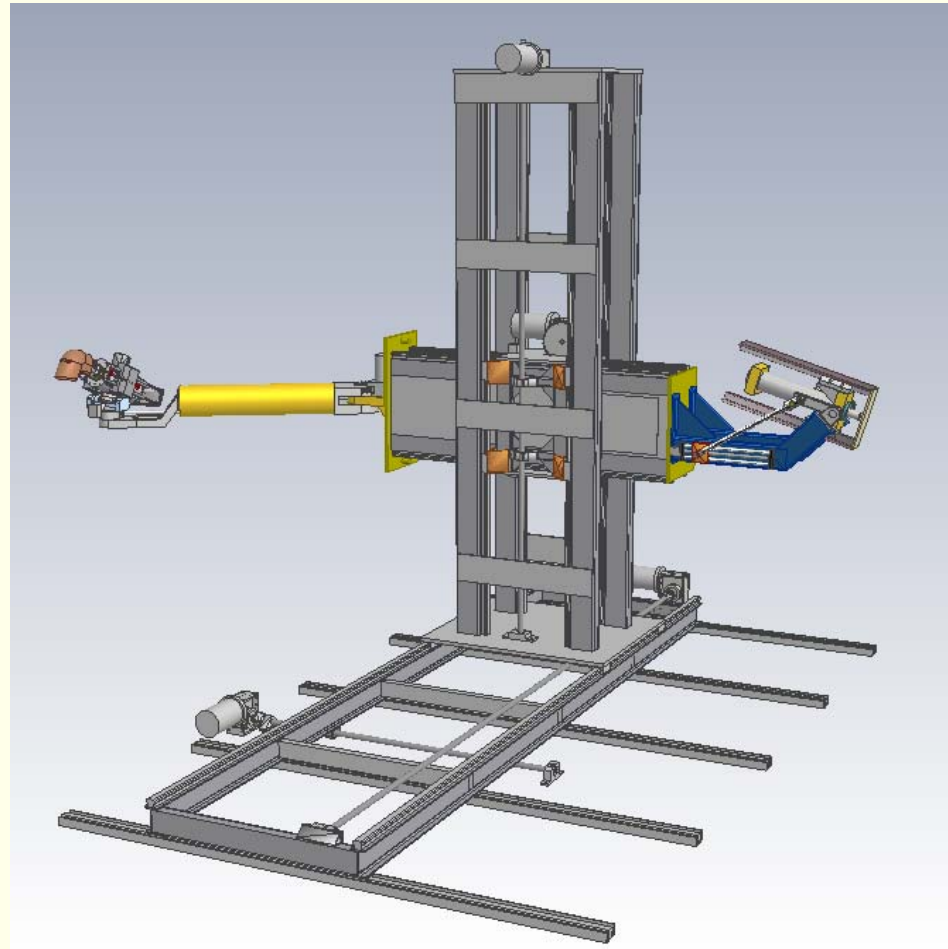


UNIVERSAL LAUNCHER



ARIES INGENIERÍA Y SISTEMAS, S.A.

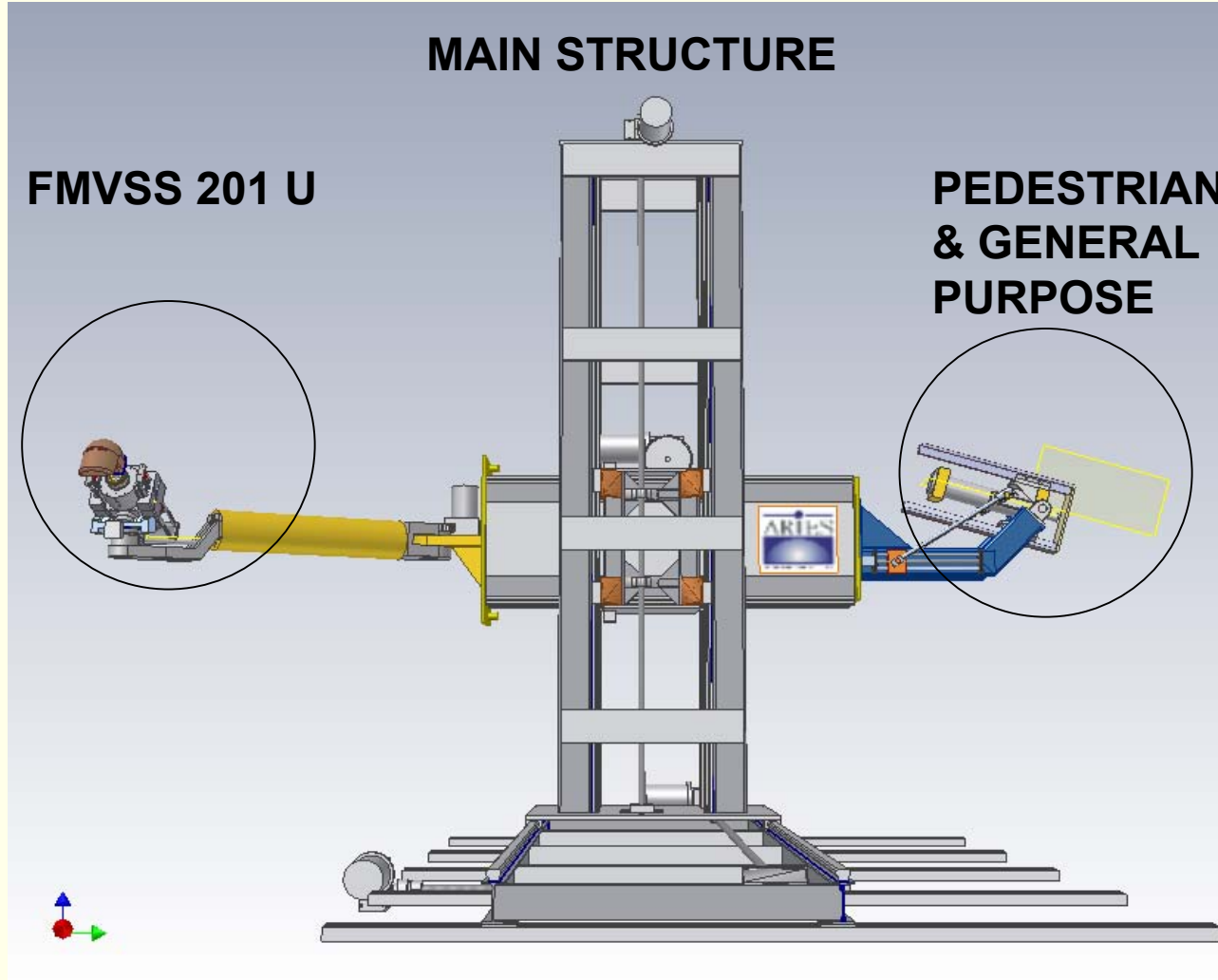
Pº Castellana, 163 - 28046 MADRID - Tel.: +(34) 915 70 27 37 - Fax: +(34) 915 70 27 66

e-mail: aries@aries-ingenieria.com - www.aries-ingenieria.com

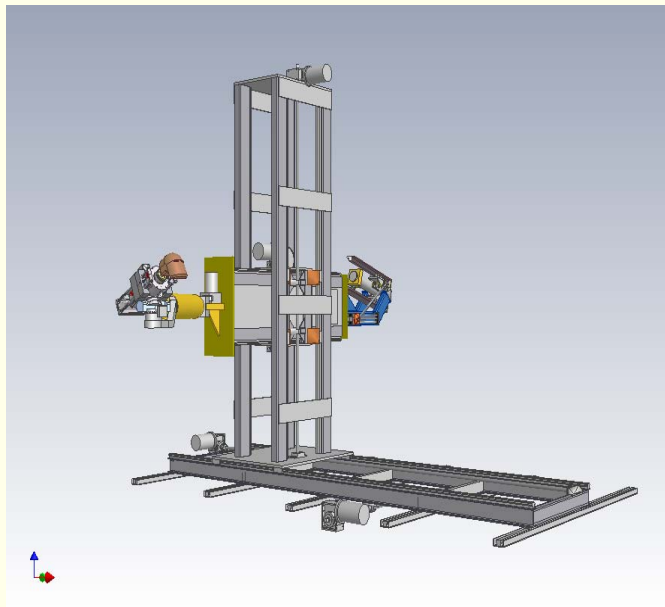
UNIVERSAL LAUNCHER1

Rev. May 2005

MULTI-PURPOSE MODULAR SYSTEM

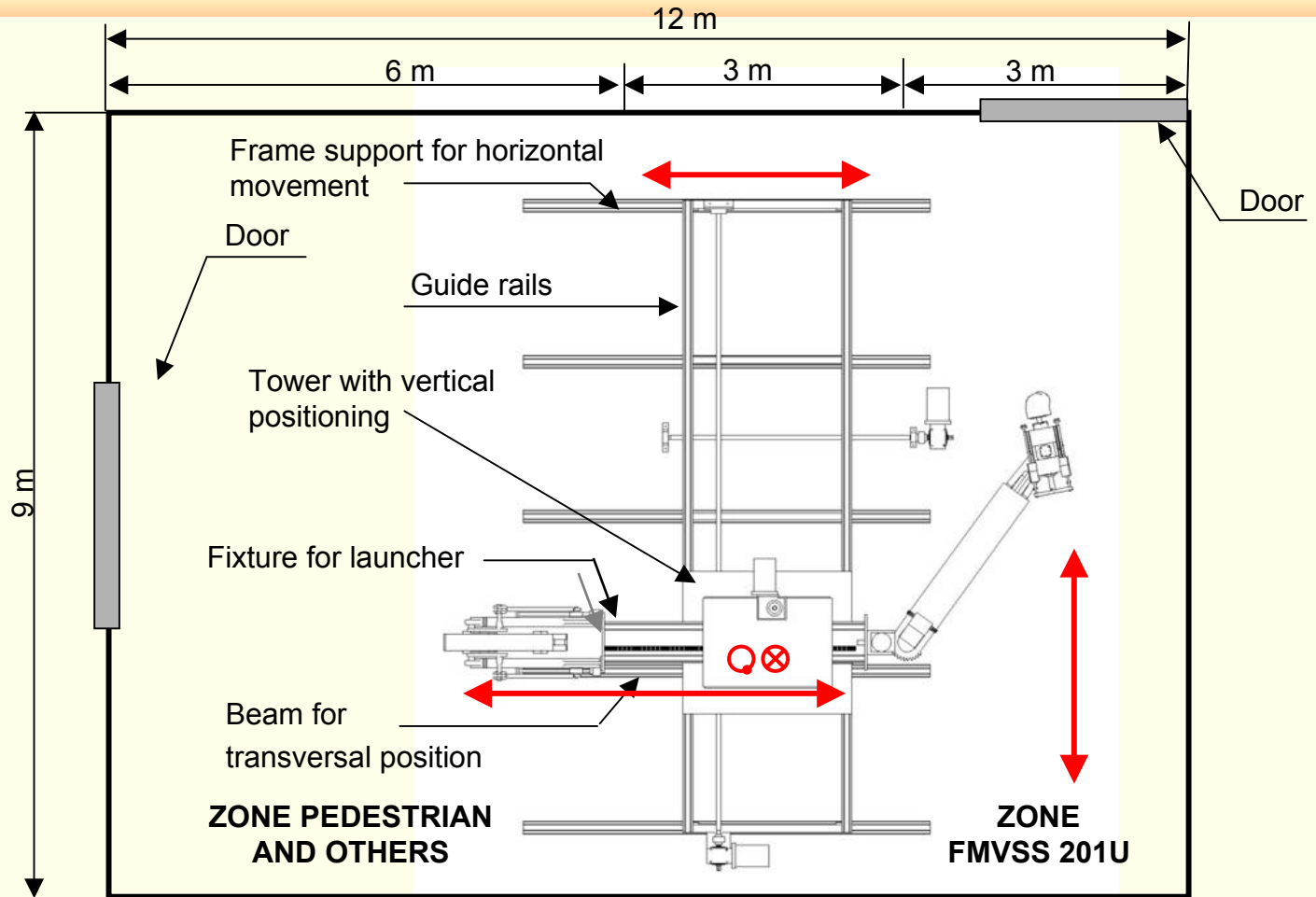


POSITIONING SYSTEM



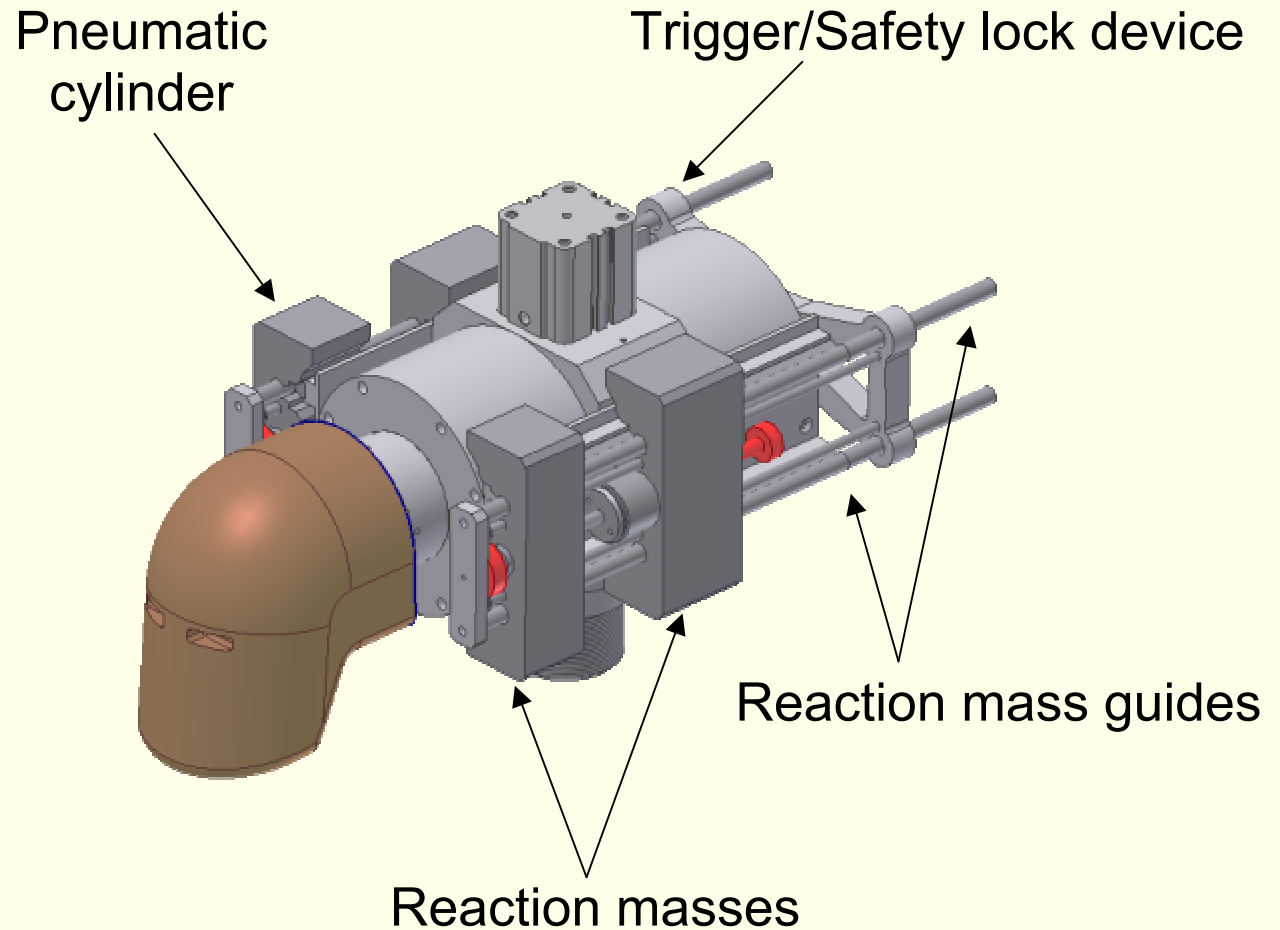
- ✓ Main structure on rail system
- ✓ Longitudinal regulation: 1500 mm
- ✓ Lateral regulation: +/- 2000 mm
- ✓ Transversal beam regulation: 1000 mm
- ✓ Vertical regulation: 500 – 3000 mm
- ✓ Motorized movement
- ✓ Positioning using encoders
- ✓ Fixture system for propulsion system (modular)

GENERAL LABORATORY LAYOUT

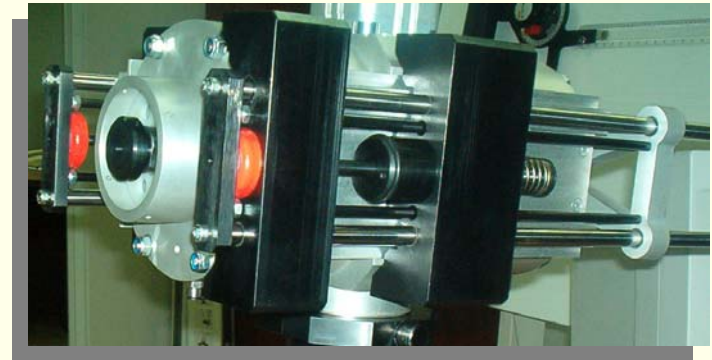
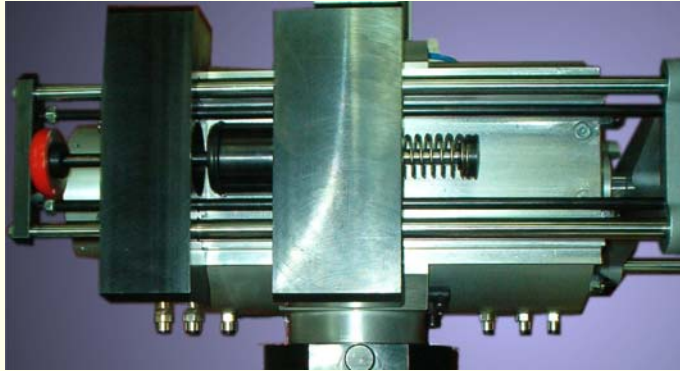


↔ Transversal movement = X
 ↕ Longitudinal movement = Y
 ⊗ Vertical movement = Z

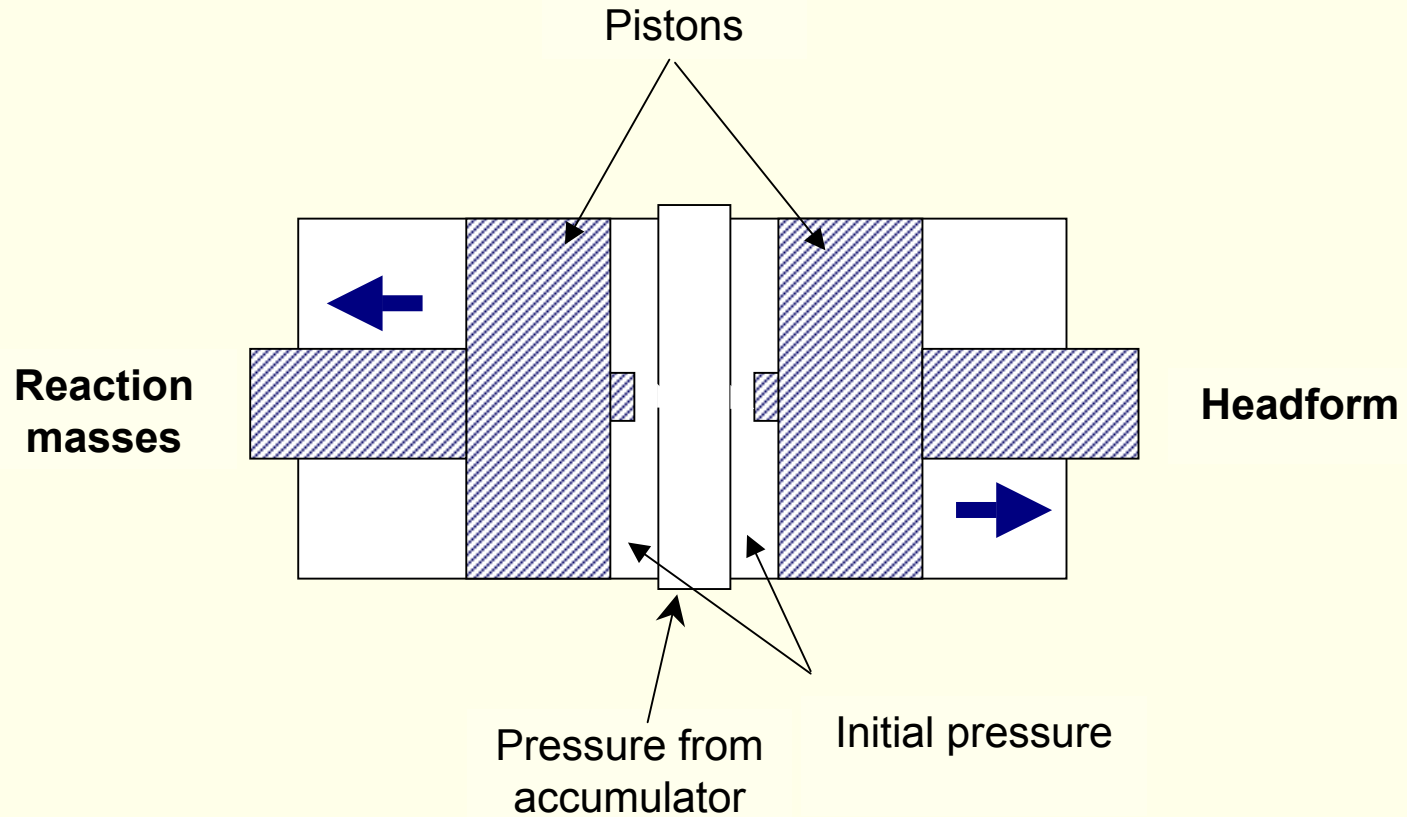
FMH SYSTEM FOR FMVSS 201-U



FMH SYSTEM FOR FMVSS 201-U

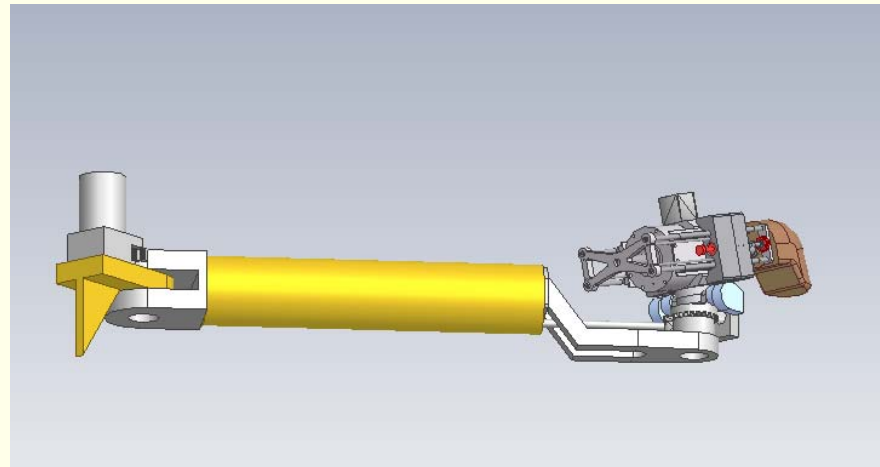
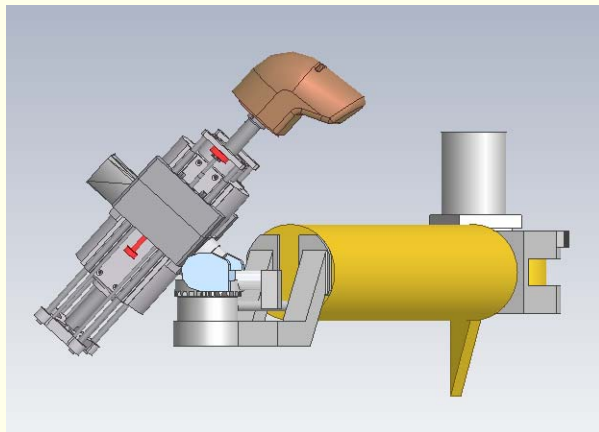


FMH SYSTEM FOR FMVSS 201-U

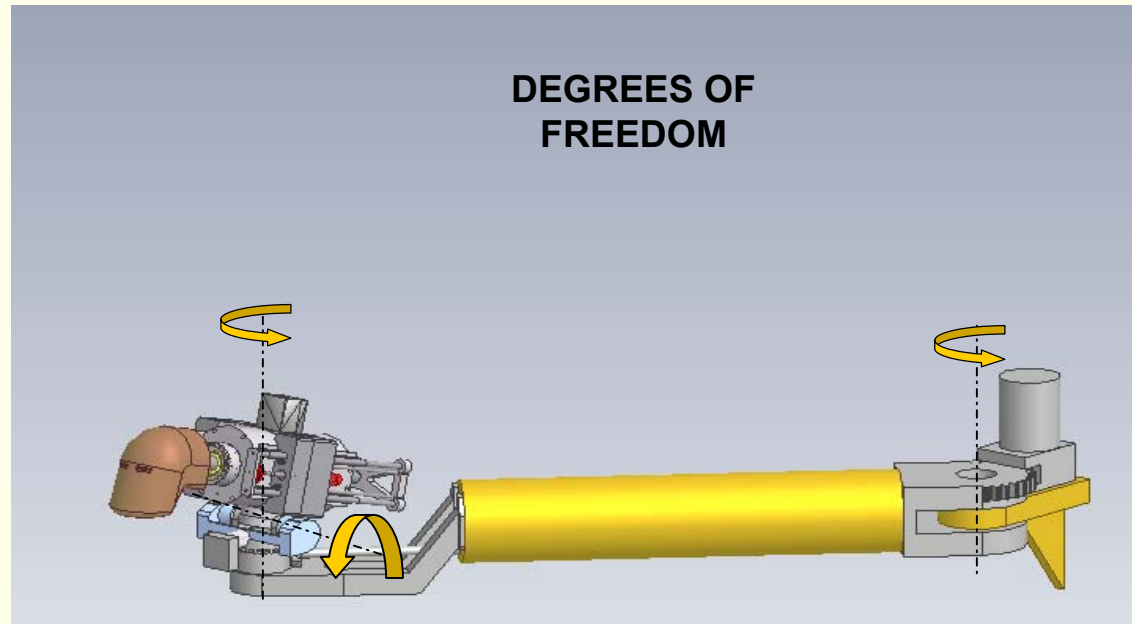


FMH SYSTEM FOR FMVSS 201-U

- ✓ **Pneumatic launcher (N2)**
- ✓ **Accumulator inside support arm**
- ✓ **Compensation of reaction forces**
- ✓ **Mounted on positioner (3 turning axis)**



FMH SYSTEM FOR FMVSS 201-U



- ✓ 12 bit encoders (rotation)
- ✓ Resolution 0,088 deg (360/4096)
- ✓ Global uncertainty
 - $\pm 0,067$ deg vertical angle
 - $\pm 0,080$ deg horizontal angle
- ✓ 12+12 bit (linear)
- ✓ Resolution 0,0023 (10mm/4096)
- ✓ Global uncertainty $\pm 0,5$ mm (positioning mechanical uncertainty)

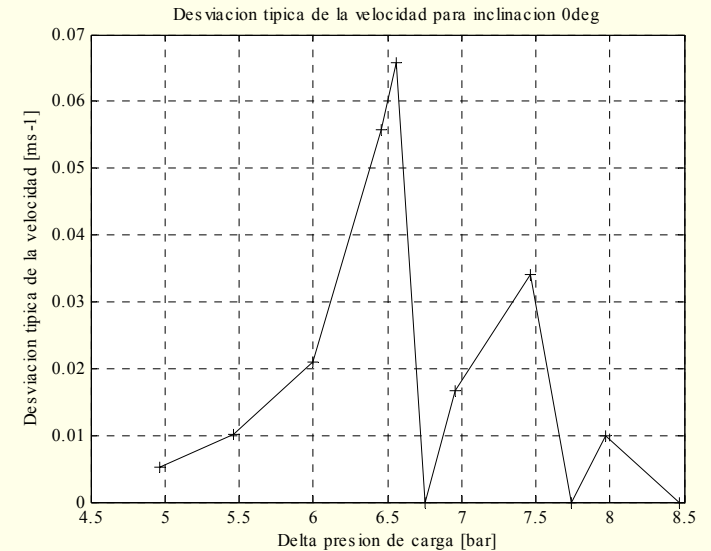
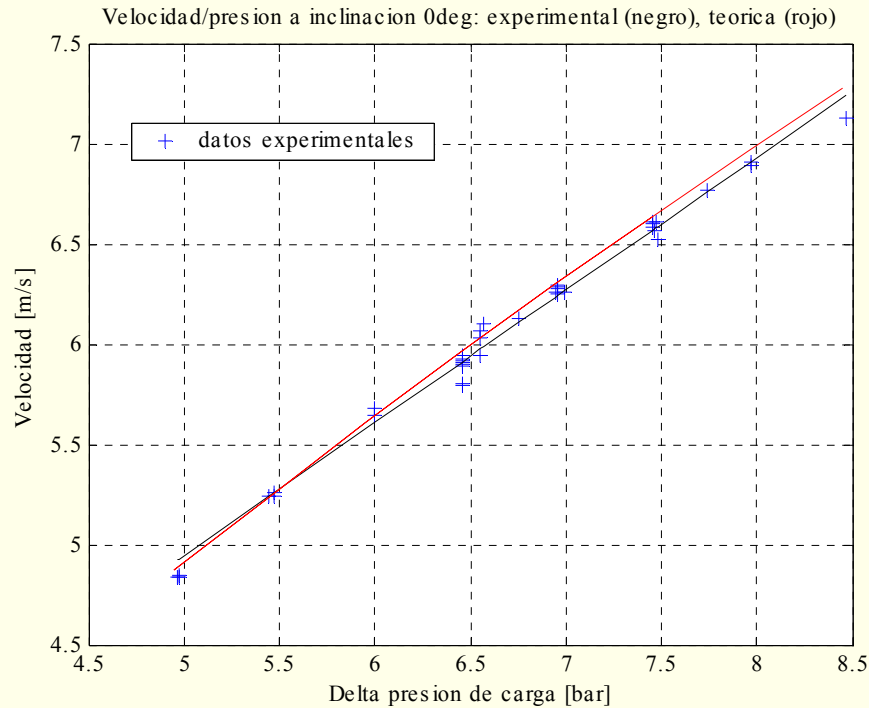
FMH SYSTEM FOR FMVSS 201-U

- ✓ Energy source: Nitrogen gas (industry standard).
- ✓ No reaction forces during firing sequence.
- ✓ Remote control of test procedure:
 - Operations for accumulator fill, pre-charge and launch sequence using electro valves (industry standard).
- ✓ Safety valve on accumulator and mechanical protection to avoid accidental firing.
- ✓ Launcher Support using adjustable locking ring.
- ✓ Head mounted on launcher at independent position.
- ✓ Monitoring of firing sequence pressure using digital manometers.
- ✓ Adjustment of launch speed using pressure.
- ✓ Fine tuning or filling pressure using pressure regulator.

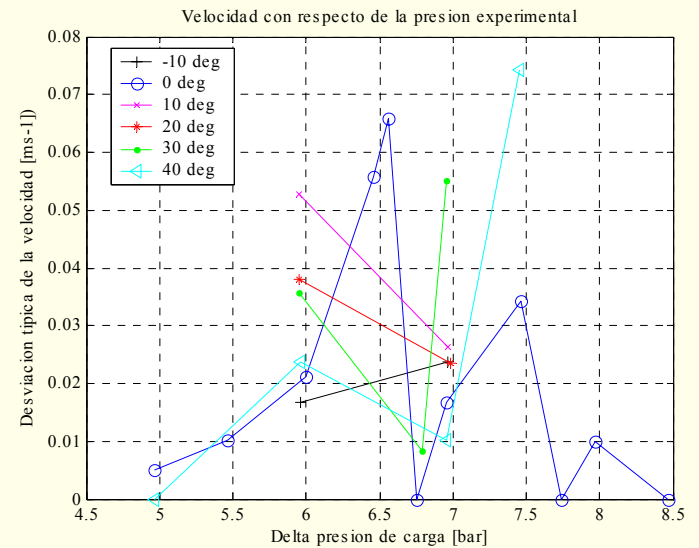
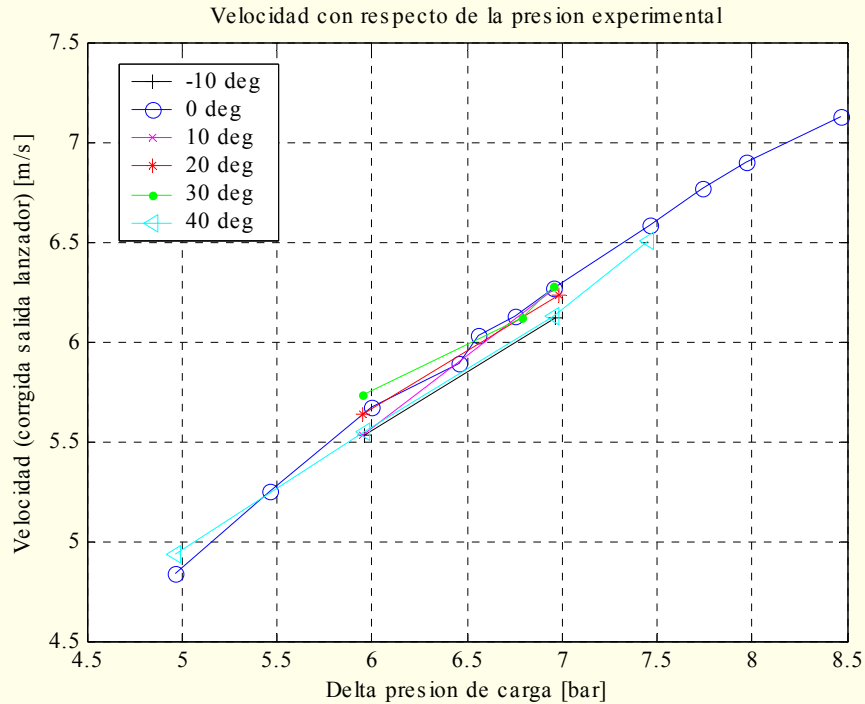
FMH SYSTEM FOR FMVSS 201-U: TECHNICAL CHARACTERISTICS

- ✓ Max. velocity: 7 m/s
- ✓ Velocity accuracy: + 0,20 km/h
- ✓ Repeatability: + 0,15 km/h
- ✓ Impactor Mass: 4,8 kg
- ✓ Horizontal angle: 0° to 360°
- ✓ Max. horizontal divergence: ± 0,1°
- ✓ Vertical angle: -10° to 50°
- ✓ Max. vertical divergence: ± 0,1°
- ✓ Guidance: Free flight only.
- ✓ Impact point precision: 5 mm radius
- ✓ Launcher mass (w/o support arm): 30 kg approx.
- ✓ Dimensions (w/o support arm): 470 x 260 x 275 mm

PRESSURE vs. IMPACT VELOCITY (0°)

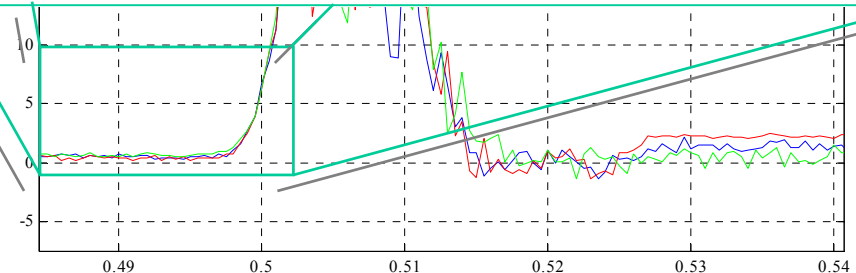
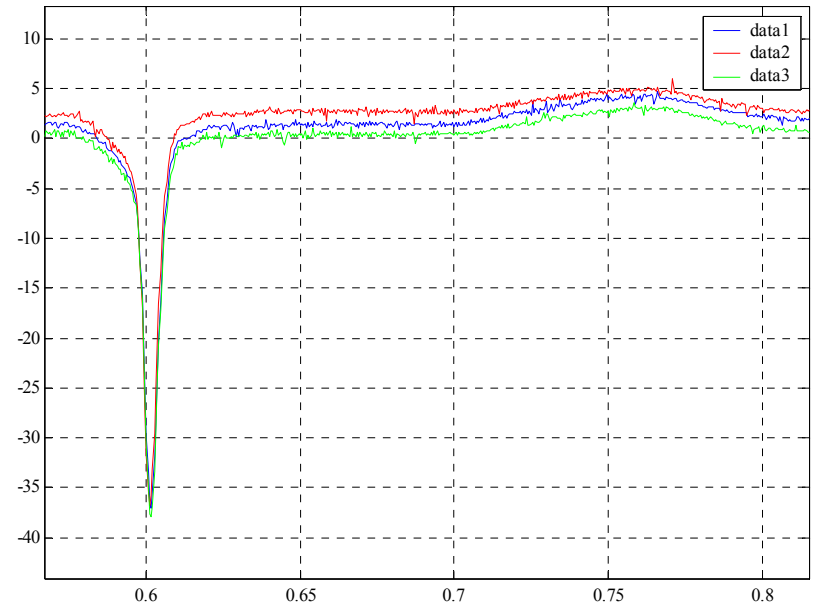


PRESSURE VS. IMPACT VELOCITY



FMH SYSTEM FOR FMVSS 201-U

REPEATABILITY OF RESULTS (3 tests with identical initial conditions)



FMH SYSTEM FOR FMVSS 201-U

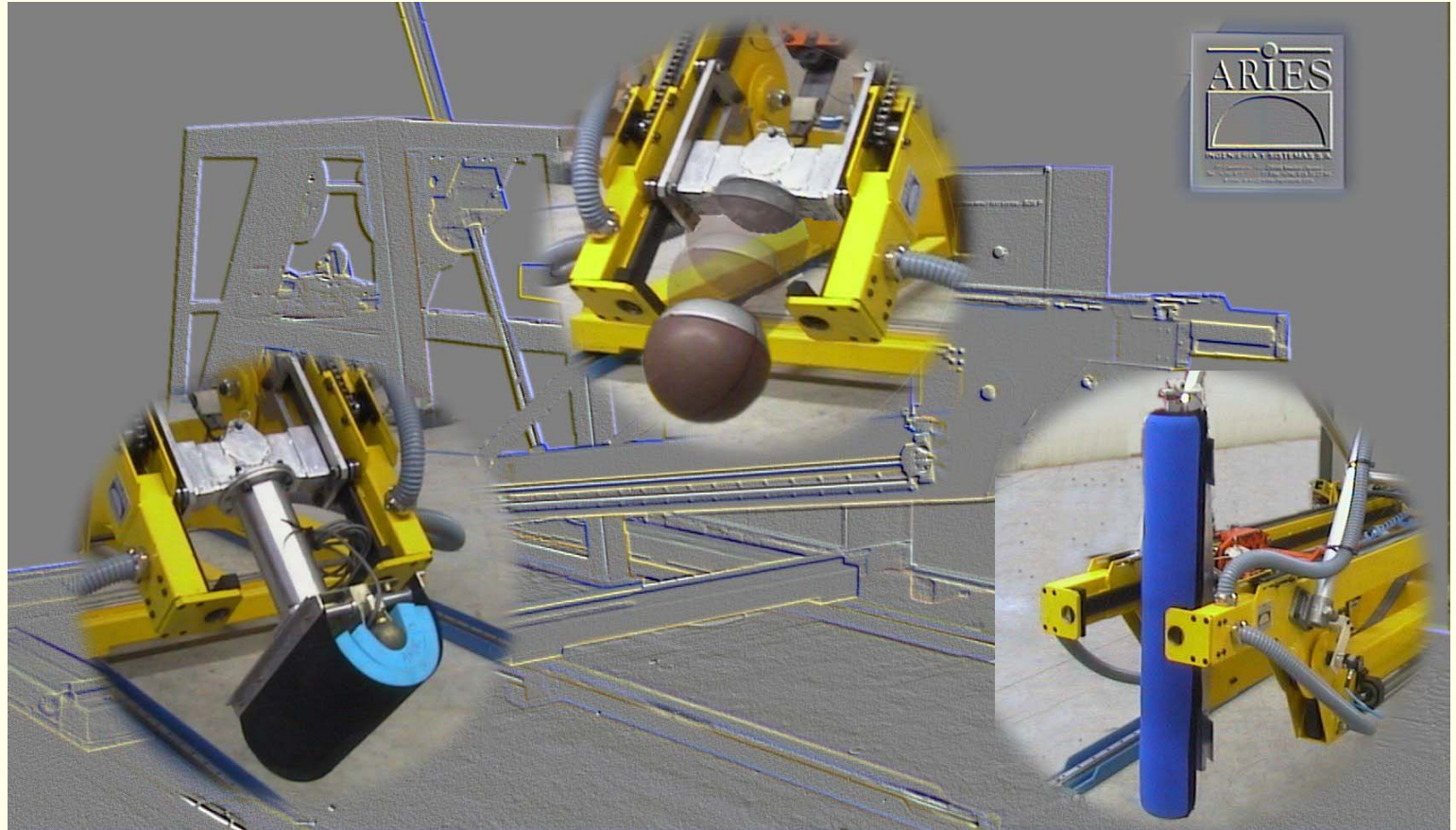
FREE MOTION HEAD FORM VIDEO

[-Test 1](#)

[-Test 2](#)

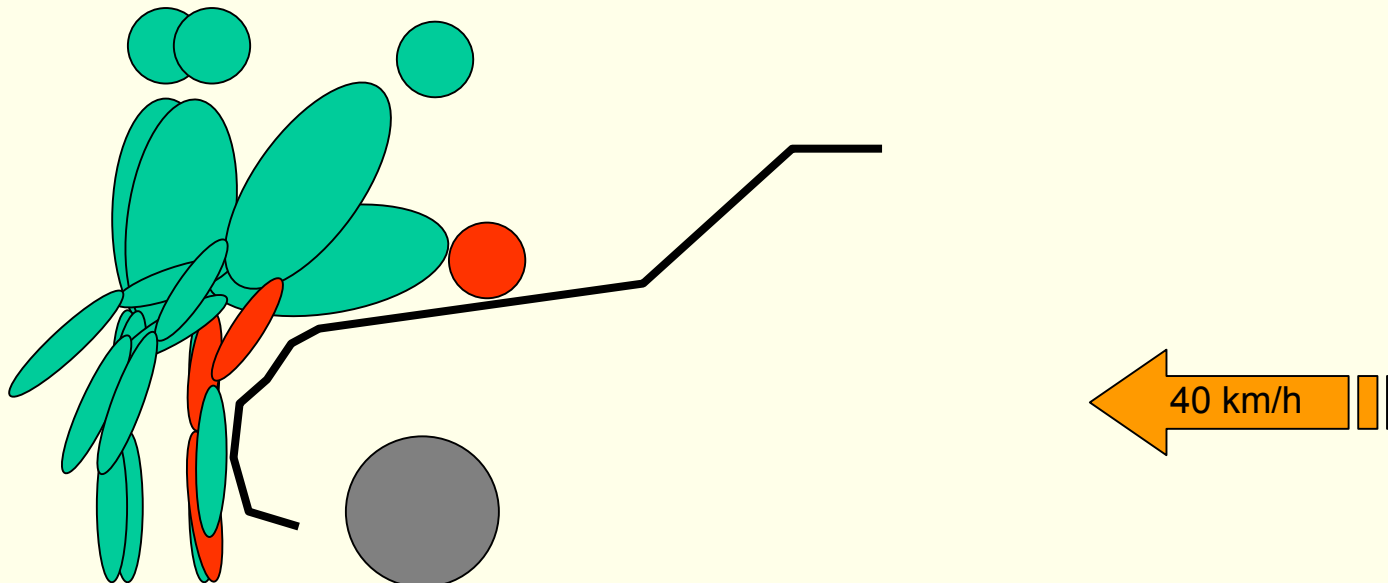
[-Test 3](#)

PEDESTRIAN IMPACT TEST SYSTEM

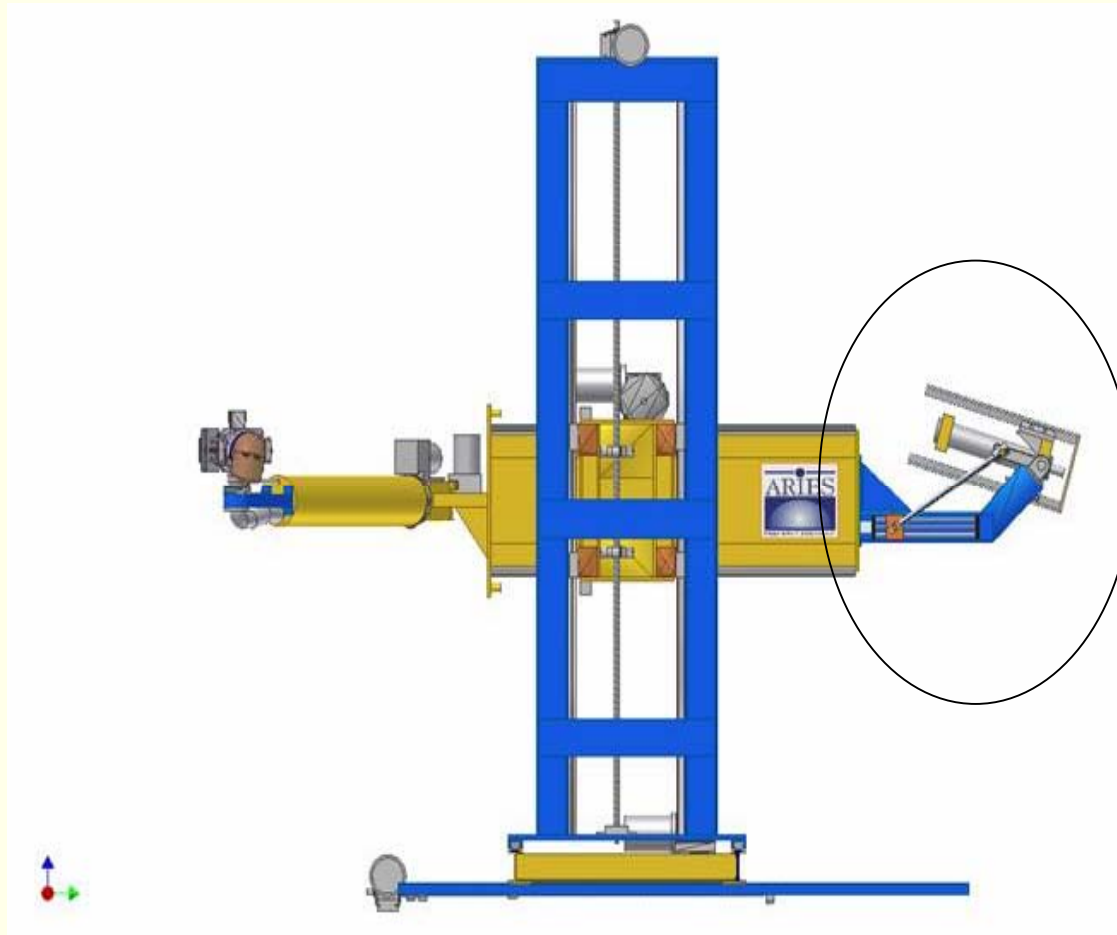


PEDESTRIAN IMPACT TEST SYSTEM

1. Free flight LEGFORM → bumper
2. Guided UPPER LEGFORM → bonnet/hood leading edge
3. Free flight HEAD FORM → bonnet/hood top



HYDRAULIC LAUNCHER



HYDRAULIC LAUNCHER

Especially designed to cover a wide range of launch energies and impact tests, both free-flight and guided.

- ✓ Pedestrian impact test protocol
 - legform, upper legform, child & adult headforms
- ✓ Modules for ECE R12 & FMVSS 203
 - Body Block & Head-Form
- ✓ Module for ECE R21 (Head-Form pedulum).
- ✓ Module for Knee Impact.
- ✓ Other impact tests.

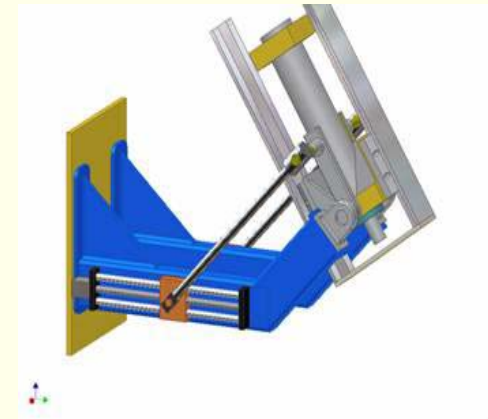
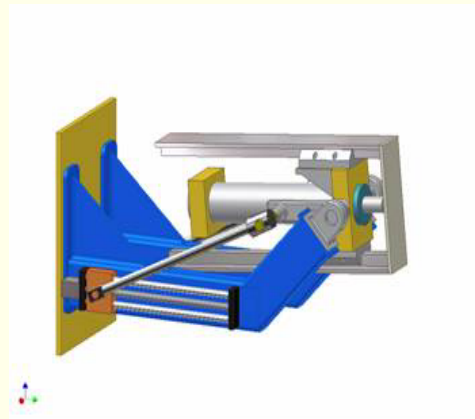
HYDRAULIC LAUNCHER

- ✓ Regulation of pressure and volume of accumulated hydraulic fluid allows for a **very precise and repeatable impact velocity**.
- ✓ The use of hydraulic fluid allows for **high pressure and high launch energy**.
- ✓ The launch mechanism combines **safety** with **simplified and clean design**.
- ✓ Only axial propulsion pressure loads on the cylinder, free from loads from headform weight and impact loads for guided impact.

HYDRAULIC LAUNCHER TECHNICAL CHARACTERISTICS

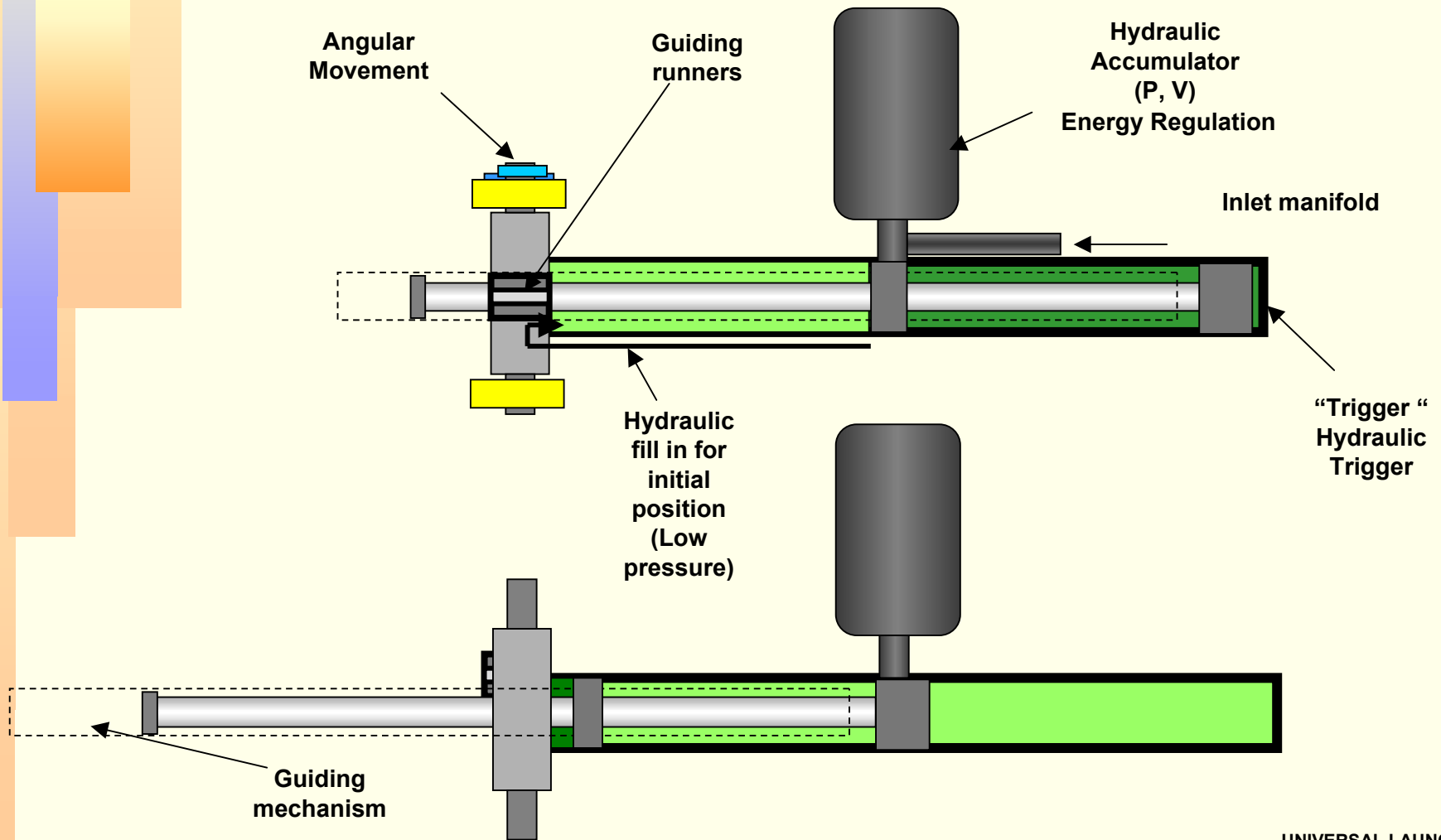
✓ Max. velocity:	14 m/s (25kg)
✓ Velocity precision:	$\pm 0,15$ m/s
✓ Repeatability:	$\pm 0,1$ m/s
✓ Masses:	2,5kg - 40kg
✓ Vertical angle:	-5° a 90°
✓ Max. horizontal divergence:	<1°
✓ Max. vertical divergence:	< 5 mm
✓ Max. lateral divergence:	< 2°
✓ Guidance:	Max. penetration 500 mm Free flight
✓ Impact point precision:	5 mm radius
✓ Launcher mass (w/o accumulator):	50 kg
✓ Dimensions (w/o accumulator):	500 x 250 x 400 mm

HYDRAULIC LAUNCHER



- ✓ Hydraulic propulsion
- ✓ Accumulator deposit connected to propulsion chamber
- ✓ No servo valves (very high flow rates)
- ✓ Separate guidance and propulsion (avoids loads on piston)
- ✓ Mounted on positioning system (1 turning axis)
- ✓ Free flight and guided impact with ONE system

PROPULSION SYSTEM



PROPULSION SYSTEM

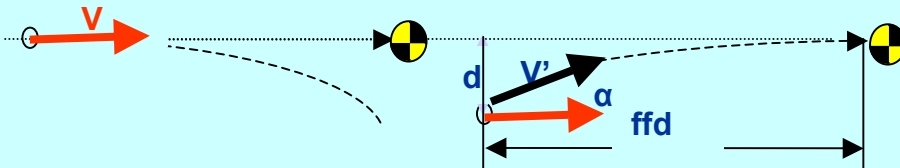


TEST METHODS AND PROCEDURES

- I. Vehicle positioning
- II. Initial aiming at the target
- III. Final aiming: gravity and geometrical corrections**
- IV. Test realisation

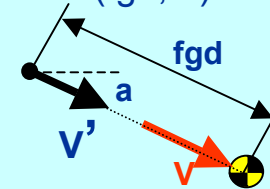
Legform:

Ballistic correction (V) → Launch angle, α (V')
 Vertical displacement, d , free flight distance, ffd



Upper legform:

Gravity correction (fgd, a) → Release speed, V'

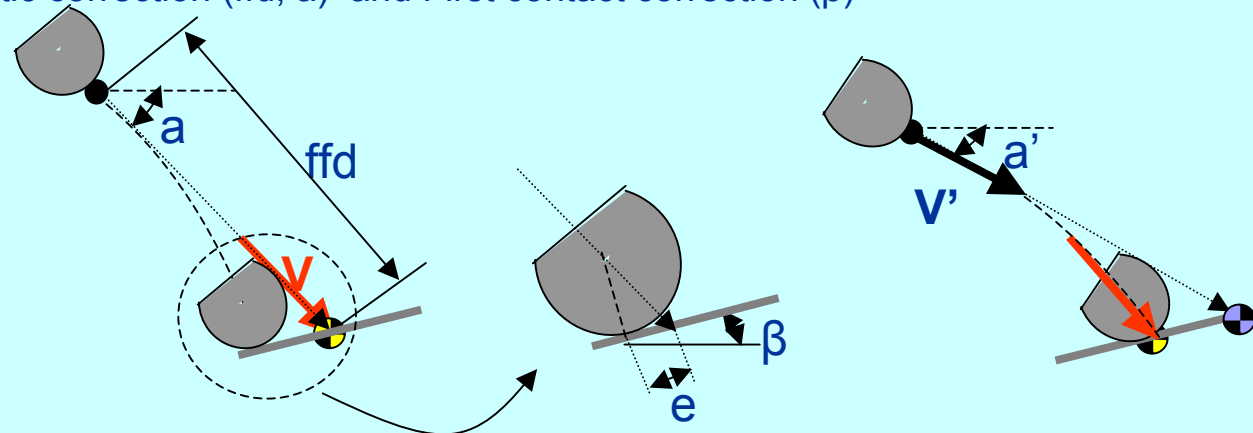


TEST METHODS AND PROCEDURES

- I. Vehicle positioning
- II. Initial aiming at the target
- III. Final aiming: gravity and geometrical corrections**
- IV. Test realisation

Head forms:

Ballistic correction (ffd , a) and First contact correction (β)



Release speed (V') and angle (a'), new aiming point

CONTROL SOFTWARE

The screenshot shows a multi-windowed control software interface titled "PEDESTRIAN". The main window, titled "BANCO PROVA URTO PEDONE", displays the following information:

- MENU:** TEST, MANUTE..., PARAMETRI, WAVEBOOK, DIADEM, ESCI
- MANUTENZIONE:**
 - STATO DEL SISTEMA:**
 - SISTEMA ARMATO
 - SISTEMA MANUALE
 - SISTEMA AUTOMATICO
 - SICUREZZE:**
 - PULSANTE DI EMERGENZA
 - AREA DI SICUREZZA ATTIVA
 - ALLARME DI INTRUSIONE
 - ALLARMI
 - SISTEMI AUSILIARI:**
 - EMISORE PRONTO
 - MISURATORE DI VELOCITÀ PRONTO
 - CARRELLO AUSILIARI:**
 - SPOSTAMENTO MASSIMO
 - SPOSTAMENTO MINIMO
 - PINZA APERTA
 - PINZA CHIUSA
- BINARIO DI INNALZAMENTO:**
 - ANGOLO BETA MASSIMO
 - ANGOLO BETA MINIMO
- BINARIO DI GUIDA:**
 - ANGOLO ALFA MASSIMO
 - ANGOLO ALFA MINIMO
- COORDINATE DI IMPATTO:**

	ATTUALE
X (mm)	4396,8
Y (mm)	1082,9
Z (mm)	794,6
ALFA DI SPARO (°)	65,5
- DISTANZA DI SPARO:**

	mm
ATTUALE	0,3
- Buttons:** ATTIVARE, DISATTIVARE

At the bottom of the interface, there is a status bar showing "17.41" and "20/07/2002".

PEDESTRIAN IMPACT FORMS

Legform

Weight :

13.4 ± 0.2 kg

Main Elements:

Tibia, femur, shear damper, foam flesh, skin

Instrumentation:

Accelerometer
Angular sensor
Displacement sensor

Consumables:

Bending ligaments
Flesh, skin



Upper legform

Weight :

Adjustable to get necessary energy

Main Elements:

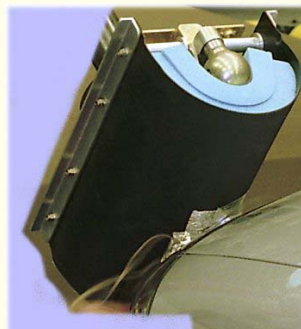
Femur, Foam flesh, Skin, Torque limiting joint

Instrumentation:

Two load cells
Strain gages

Consumables:

Skin and flesh



Head forms

Weight :

4.8 ± 0.1 kg (Adult)
3.5 ± 0.1 kg (ACEA)
2.5 ± 0.05 kg (Child)

Main Elements:

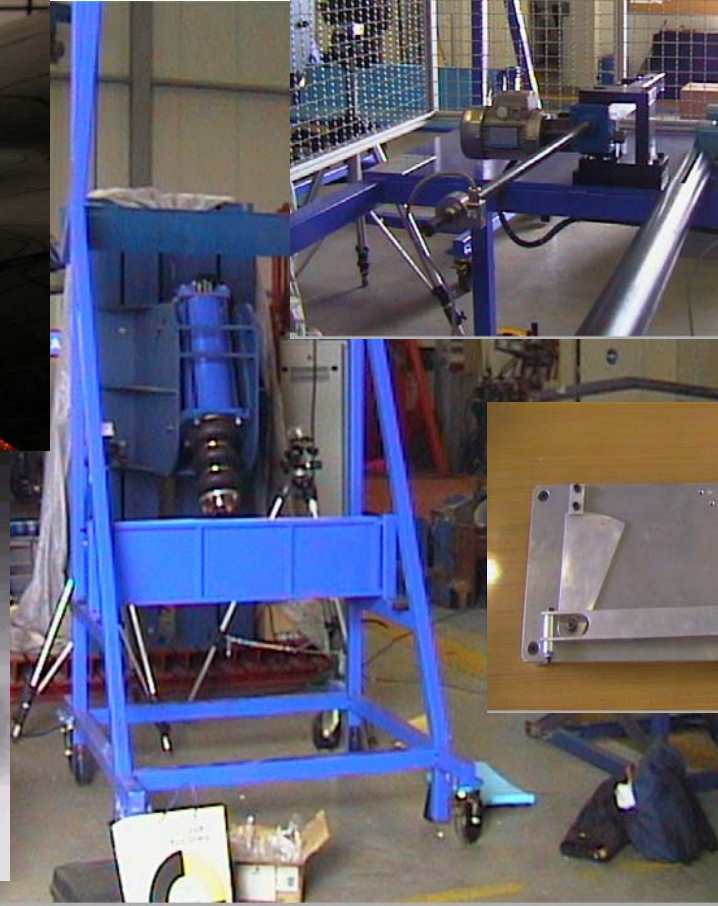
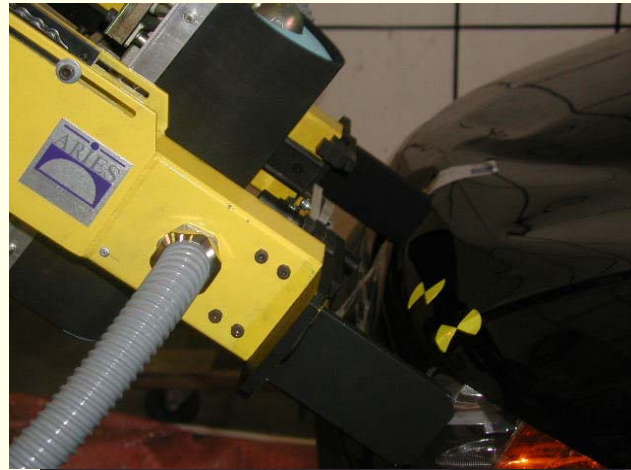
Sphere, skull cup, end plate

Instrumentation:

Tri-axial accelerometer



CALIBRATION RIGS, IMPACTORS AND SPARE PARTS



CONCLUSIONS

- ✓ A **modern** system, **reliable, flexible and accurate**
- ✓ A system to be **adapted to most testing needs** and applications with free-flight and/or guided impacts
- ✓ Aries broad **experience & capability** to provide turnkey test solutions
- ✓ **Easy-to-use** positioning system in car coordinates for accurate test results.
- ✓ **User-friendly** software for **fast and safe operation**: SW calculates the need for compensation for gravity effects automatically.
- ✓ **Modular system** for different test protocols allows for future upgrades.

CONCLUSIONS

- ✓ **One** Hydraulic Actuator for 3 types of tests:
 - **Pedestrian** protection
 - **ECE R12 & FMVSS 203**
 - **Knee Impact**
 - **ECE R21**
- ✓ No need for time-consuming change of propulsion system between tests.
- ✓ No servo-valves:
 - High instantaneous flow rates without penalty for the dynamic response of the system.
 - **Reduced maintenance.**
- ✓ Acceptable acceleration levels up to release (legform impact):
 - Avoids deformation of knee joint and foam during the acceleration run.
- ✓ Separate guidance and propulsion (avoids impact loads on piston)
- ✓ Very precise and repetitive setting of impact velocity.

ARIES UNIVERSAL LAUNCHER

**THANK YOU FOR YOUR
ATTENTION!**

ARIES INGENIERIA Y SISTEMAS, S.A.

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