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agenda item 2(a))

Transmitted by the expert from Japan

Status Report on Flexible Pedestrian Legform Impactor Technical Evaluation Group (Flex-TEG) Activities

Atsuhiro Konosu
Chairperson of Flex-TEG, Japan

Latest Flex-TEG Activities (6th Flex-TEG meeting)

Participants of 6th Flex-TEG meeting (31 March 2008, BASt, Germany)

A. Konosu（Flex-TEG chairperson/J-MLIT/JARI）
B. Been（Flex-TEG secretariat/FTSS-Europe）
O. Zander (BASt), D.U. Gehring (BGS)
D. Cesari (INRETS), S. Ronel (INRETS/Lyon Univ.)
S. Meyerson (NHTSA), A. Mallory (TRC/VRTC)
O. Ries and S. Siems (ACEA/VW)
R. Fleischhacker and J. Walldorf (ACEA/Porsche)
F. Matsuoka (JAMA/Toyota),
D. Longhitano (Honda R&D Americas)
F. Minne (UTAC)
K. Wolff (Continental)
G. Zenz (SABIC)
J.C. Kolb (Berbraudt)
M. Winkler and D. Arp (MESSRING)
S. Pruitt (DTS)
T. Inoue (JASTI)
M. Burleigh (FTSS-UK)
Total: 23 persons

Latest Flex-TEG Activities (6th Flex-TEG meeting)

Main part of Agenda of the 6th Flex-TEG meeting

5. Reports and Discussions: Flex-GT Technical Evaluation Results
- **5.1. NHTSA Flex-GT Test summary (TEG-063)**
- **5.2. NHTSA Flex-GT Certification Tests (TEG-064)**

6. Finalization: Flex-GTR Designs
- **6.1. Mechanical Design**
  - **6.1.1. Flex-GTR Mechanical Design (TEG-054)**
- **6.2. Instrumentation and Electrical Design**
  - **6.2.1. Flex-GTR Instrumentation Electrical Design (TEG-055)**
- **6.3. Full Calibration Test Procedure**
  - **6.3.1. Flex-GTR Full Calibration Test Procedure (TEG-056)**
  - **6.3.2. BASt Proposal for a Full Assembly Certification Test (TEG-062)**
- **6.4. Optional Instrumentation**
  - **6.4.1. Flex-GTR Optional Instrumentation (TEG-057)**
  - **6.4.2. Onboard DAS Information (TEG-058, TEG-059)**
- **6.5. Others**
  - **6.5.1. Information: NHTSA Design of a Proposed Upper Body Mass (TEG-065)**

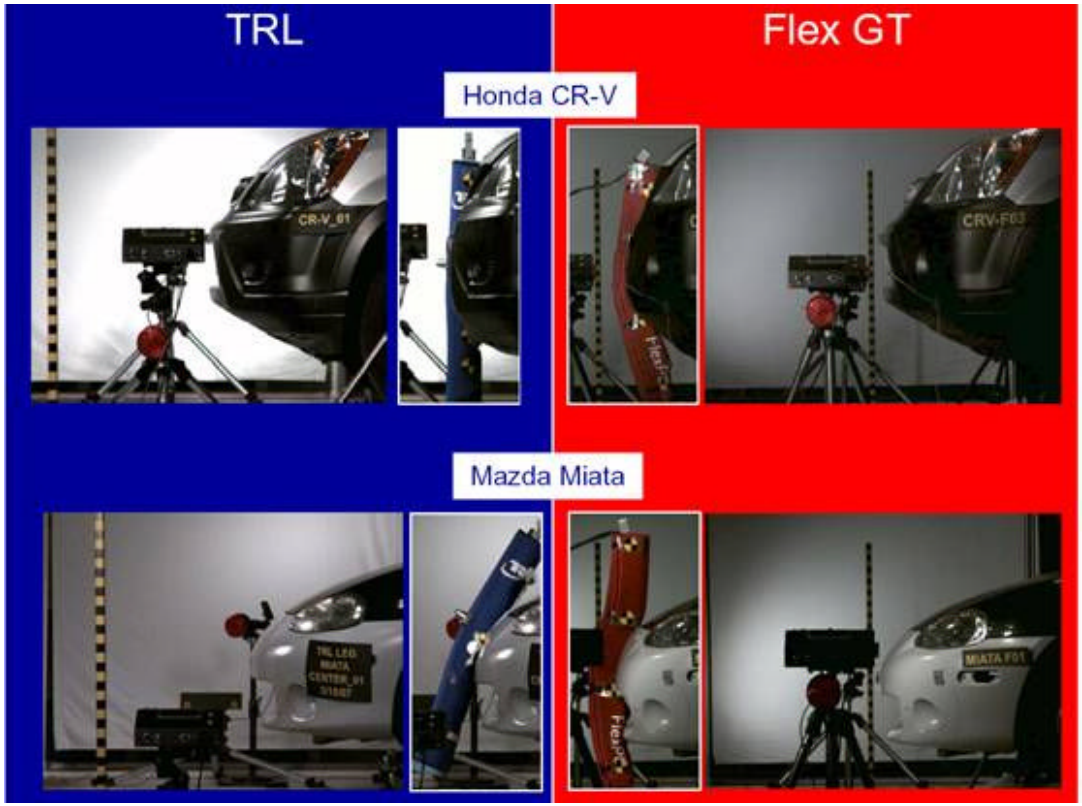
7. Future action plans

Latest Flex-TEG Activities (6th Flex-TEG meeting)

5. Reports and Discussions: Flex-GT Technical Evaluation Results

5.1. NHTSA Flex-GT Test summary (TEG-063)
5.2. NHTSA Flex-GT Certification Tests (TEG-064)

NHTSA Flex-GT Evaluation Tests



- **Repeatability, usability, and durability of Flex-GT are evaluated, and also comparisons between the TRL legform impactor and Flex-GT are conducted.**
- **These results are used for following discussions on the Flex-GTR finalization.**

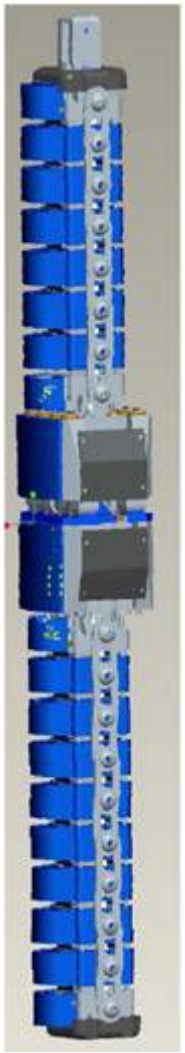
Latest Flex-TEG Activities (6th Flex-TEG meeting)

6. Finalization: Flex-GTR Designs

6.1. Mechanical Design

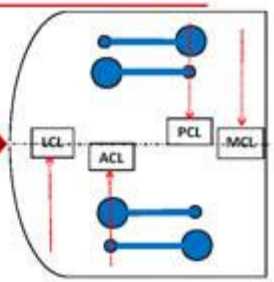
6.1.1. Flex-GTR Mechanical Design (TEG-054)

Flex-GTR (CAD model)



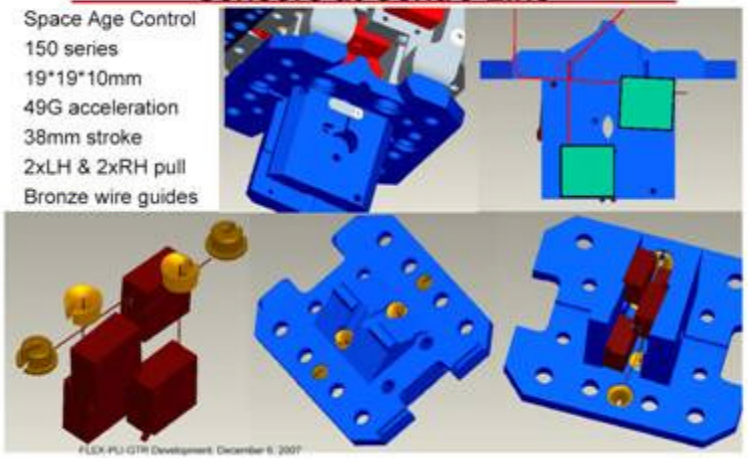
Conceptual Design

- To avoid A-symmetric sensitivity
  - Move MCL & LCL at centerline
  - Move ACL & PCL close to centerline
- To avoid knee twist
  - Use two sets of cruciate ligaments
  - To neutralize twist moment
- Cruciate ligaments 8 springs
  - DBØ12xØ6x40mm; 71.6N/mm
  - May need to go Ø3mm cable
  - Optimized space for DAS & connector
- Lateral ligaments 16 springs same
  - DBØ18xØ9x80mm; 76.7N/mm

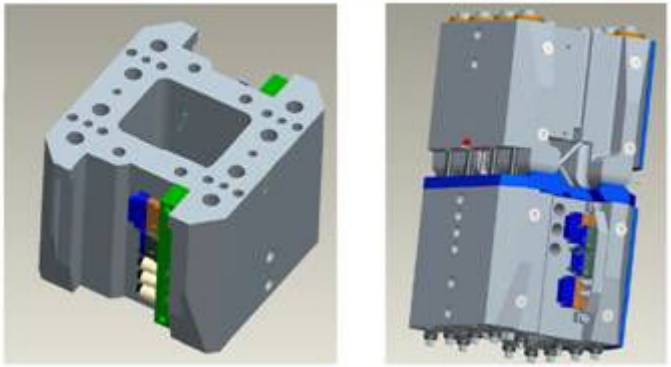


Packaging Ligament Elongations Sensors at Centre Line

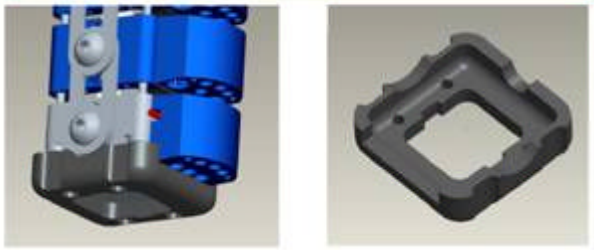
Space Age Control
150 series
19*19*10mm
49G acceleration
38mm stroke
2xLH & 2xRH pull
Bronze wire guides



Integration of connector blocks and wiring



Protective rubber bumpers to distal and proximal ends



- **Flex-GTR Mechanical Designs are frozen.**

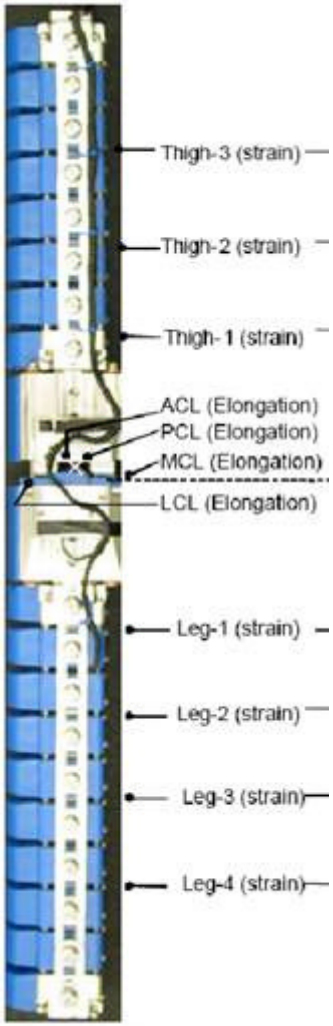
Latest Flex-TEG Activities (6th Flex-TEG meeting)

6. Finalization: Flex-GTR Designs

6.2. Instrumentation and Electrical Design

6.2.1. Flex-GTR Instrumentation Electrical Design (TEG-055)

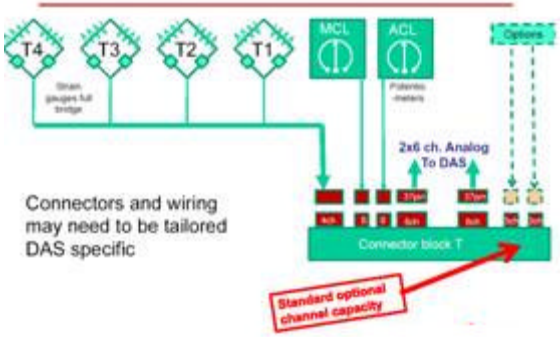
Flex-GTR (Electrical design)



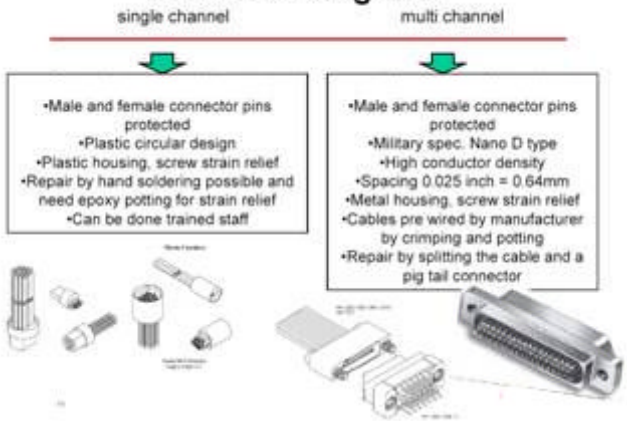
Measurement Items (Standard)

Channel	Purpose	Standard	Option	DAS	Priority
Femur moment 1, 2 and 3	Calibration	3	0	Standard option On board DAS	
Tibia moment 1, 2, 3 and 4	Injury	4	0		
Tibia top acceln ax	Calibration	1	-1		
MCL elongation	Injury	1	0		
ACL elongation	Calibration	1	0		
PCL elongation	Calibration	1	0		
LCL elongation	Calibration	1	0		

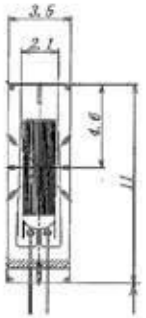
Wiring Diagram Tibia 2*37 pin



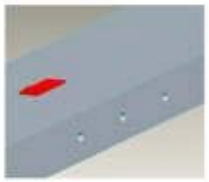
Connectors agreed



Strain Gauges



- FLEX-GT specs and adhesive are going to be used
- Uni-axial, 5mm length, 350 Ohm



- **Flex-GTR electrical designs are frozen, except ACL and PCL measurement purpose, injury assessment purpose and/or calibration purpose.**

Latest Flex-TEG Activities (6th Flex-TEG meeting)

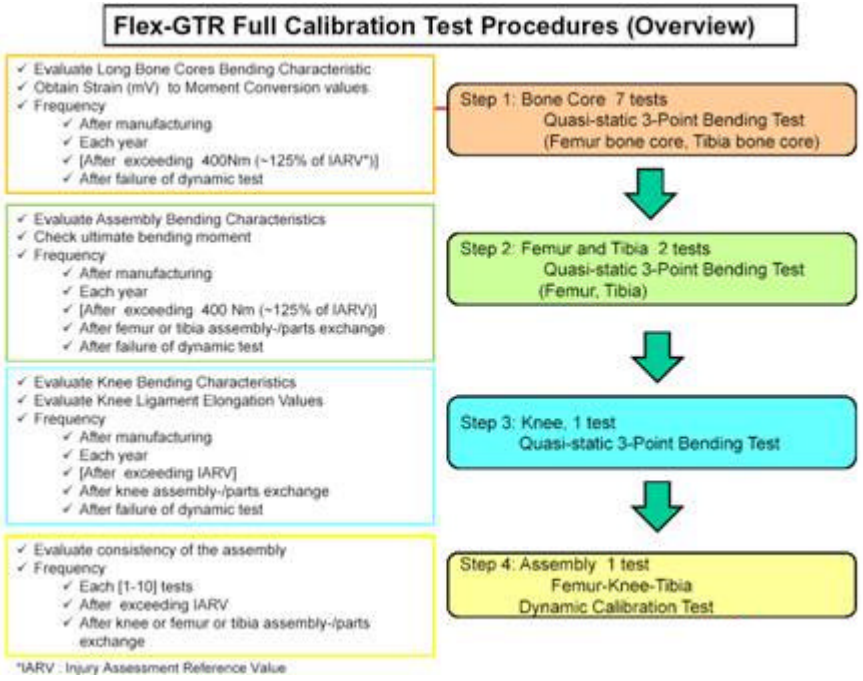
6. Finalization: Flex-GTR Designs

6.3. Full Calibration Test Procedure

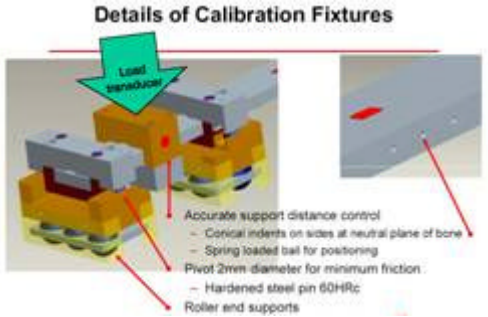
6.3.1. Flex-GTR Full Calibration Test Procedure (TEG-056)

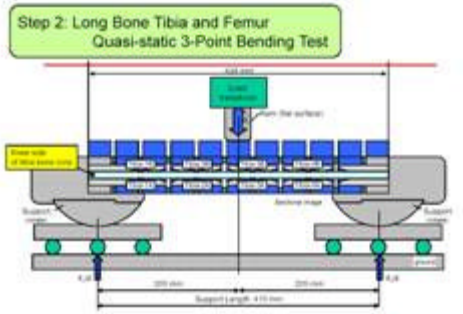
6.3.2. BASt Proposal for a Full Assembly Certification Test (TEG-062)

Flex-GTR (Full Calibration Test Procedure)



Component Level

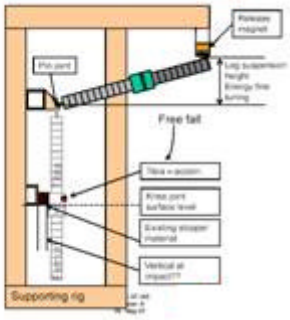


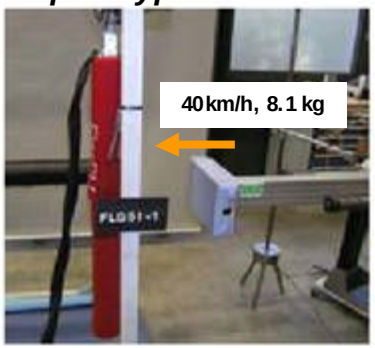


Assembly Level

Pendulum type ***or*** ***Impact type***

- Calibration rig with support arm and release magnet
- Control input pulse with tibia x-acceleration
- Control parameters
  - Drop height
  - As tibia proximal
  - MCL, ACL, PCL (and LCL)
  - Tibia bending moments
  - No pass-fail parameter femur bending moments
  - Target corridor ±10% from average





- **Flex-GTR full calibration test procedures are frozen, except type of assembly level calibration test method, pendulum type or impact type.**

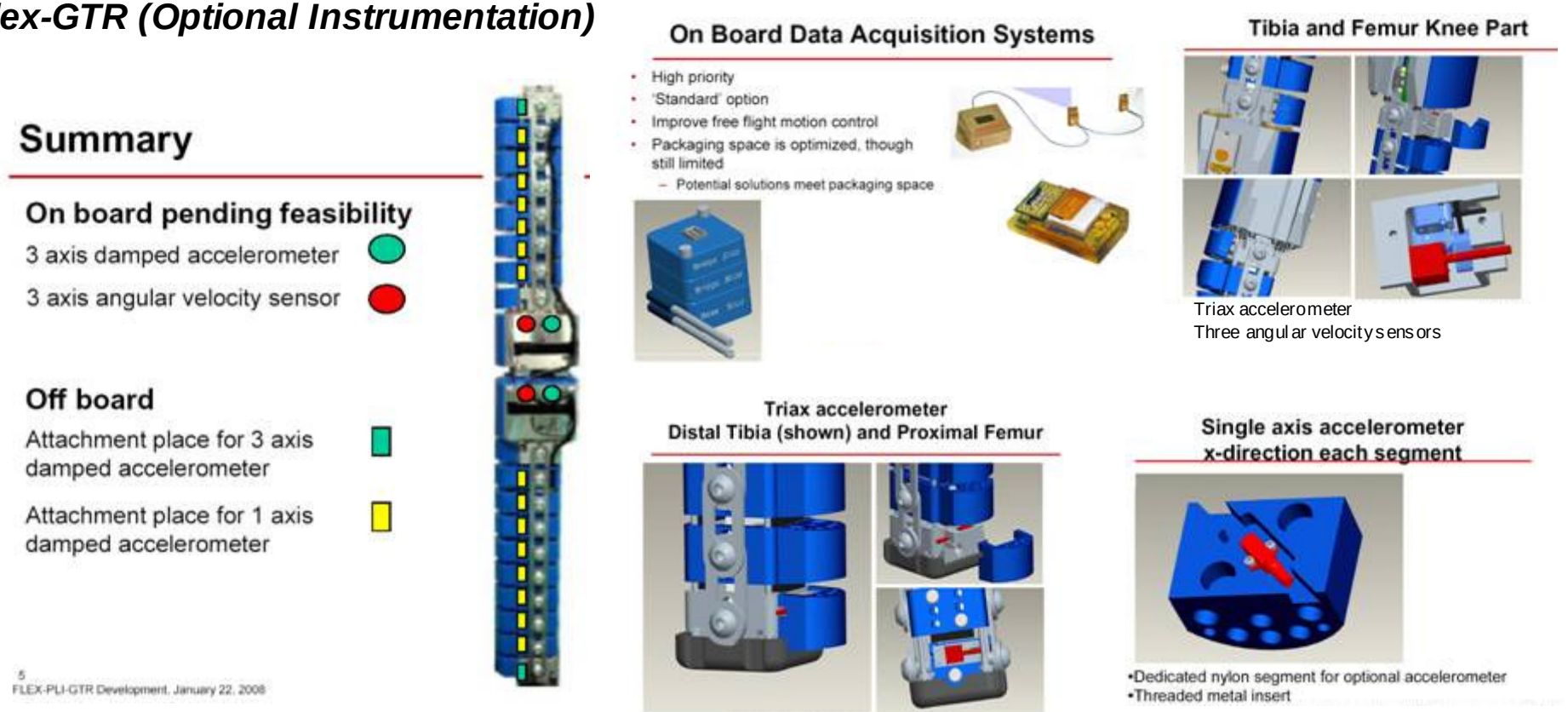
Latest Flex-TEG Activities (6th Flex-TEG meeting)

6. Finalization: Flex-GTR Designs

6.4. Optional Instrumentation

- 6.4.1. Flex-GTR Optional Instrumentation (TEG-057)
- 6.4.2. Onboard DAS Information (TEG-058, TEG-059)

Flex-GTR (Optional Instrumentation)



- **Flex-GTR Optional Instrumentation designs are frozen.**

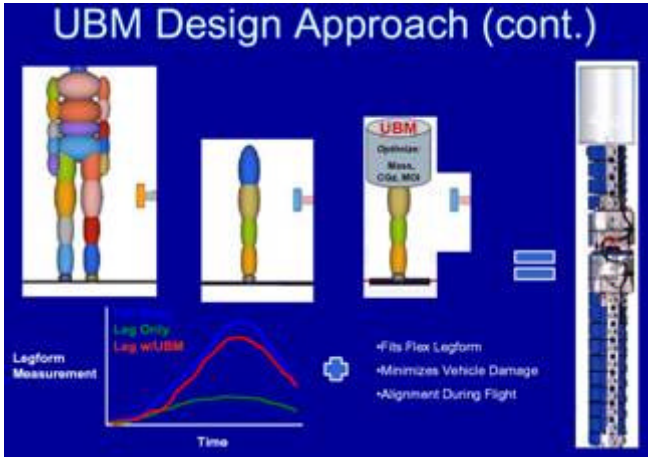
Latest Flex-TEG Activities (6th Flex-TEG meeting)

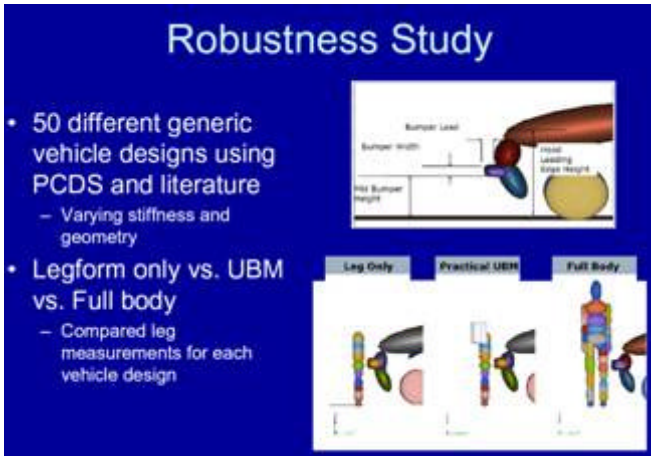
6. Finalization: Flex-GTR Designs

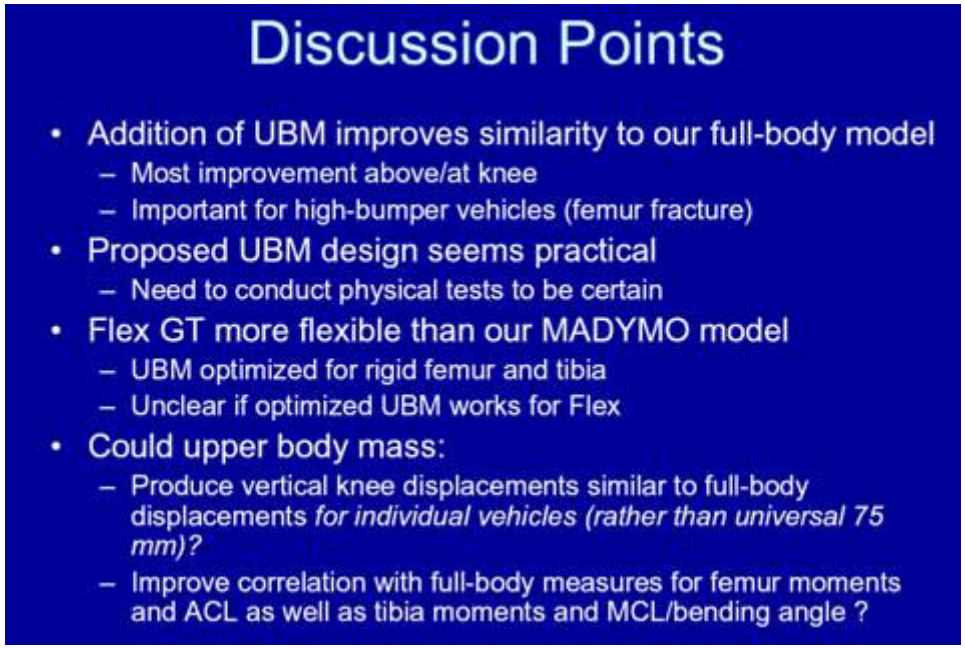
6.5. Others

6.5.1. Information: NHTSA Design of a Proposed Upper Body Mass (TEG-065)

Information: NHTSA Design of a Proposed Upper Body Mass







- **As information, NHTSA upper body mass study is informed.**
- **Status of the research is an initial stage, e.g. rigid femur and rigid tibia is used in their study, therefore, Flex-TEG does not treated this topic in the Flex-TEG activities (future work for another group).**

Latest Flex-TEG Activities (6th Flex-TEG meeting)

7. Future action plans

By the end of September 2008

- **Flex-GTR developer group will product Flex-GTR, and conduct Flex-GTR evaluations by them.**
- **Flex-TEG members will discuss and decide the ACL and PCL measurement purpose, Injury assessment and/or Calibration.**
- **Flex-TEG members will discuss and decide the type of assembly level calibration test method for Flex-GTR, pendulum type or impact type**

☆ **7th Flex-TEG meeting**

From October 2008 to the end of April 2009

- **Initial technical evaluation of the Flex-GTR will be conducted by main Flex-TEG members.**

☆ **8th Flex-TEG meeting**

Flex-GTR

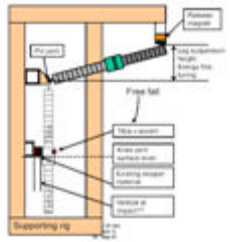
Measurement Items (Standard)

Channel	Purpose
Femur moment 1, 2 and 3	Calibration
Tibia moment 1, 2, 3 and 4	Injury
Tibia top acceln ax	Calibration
MCL elongation	Injury
ACL elongation	Calibration
PCL elongation	Calibration
LCL elongation	Calibration

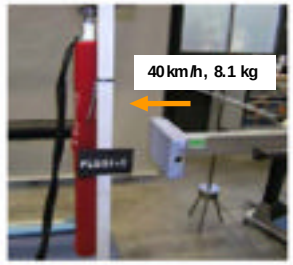
Assembly Level

Pendulum type

- Calibration rig with support arm and release magnet
- Control input pulse with tibia x-acceleration
- Control parameters



or Impact type



** 1) Review of Injury Risk Functions, 2) Evaluations of Technical Feasibilities, 3) Evaluation of Lower Limb Protection Level of Flex-GTR, and 4) Documentation Activities, will be conducted in parallel on above activities.*

Thank you for your attentions!